Code No: R21015/R10 **Set No. 1**

II B.Tech I Semester Regular Examinations, November 2012
SURVEYING
(Civil Engineering)

Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Describe plane Table Radiation method with the help of a neat sketch. Under what circumstances this method is resorted to.
   (b) Discuss the advantages and disadvantages of plane table Surveying over other methods of Surveying. [8+7]

2. (a) What are the essential differences between chain Survey and compass Survey. Under what circumstances compass Survey is preferred to other types of Surveys.
   (b) Find which station is free from local attraction and work out the correct bearings.

Line	F.B	B.B
AB	$191^o45'$	$13^o00'00''$
BC	$39^o30'$	$222^000'30''$
CD	$22^o15'$	$200^030'00''$
DE	$242^o45'$	$60^045'00''$
EA	$330^o15'$	$147^045'00''$

[8+7]

3. The following observations were made during the testing of a dumpy level:

Instrument at	Staff reading on	
	A	B
A	1.702	2.244
B	2.146	3.044

Distance AB=150m Is the instrument in adjustment? To what reading should the line of collimation be adjusted when the instrument was at B? If the R.L of A=432.052, what should be the R.L. of B. [15]

4. What is Simpson's rule? Derive an expression for it. How does it compare with other rules. [15]

5. (a) Explain the adjustment for making the axis of the spirit level over T-frame of the vertical circle perpendicular to the vertical axis of the theodolite.
   (b) Explain the procedure of measuring a vertical angle. What do you understand by index error? How would you eliminate it? [9+6]

6. A tacheometer was set up at a station A and the readings on a vertically held staff at B were 2.255, 2.605 and 2.955, the line of sight being at an inclination of

$+8^0 24'$. Another observation on the vertically held staff at B.M. gave the readings 1.640, 1.920 and 2.200, the inclination of the line of sight being $+1^0 6'$. Calculate the horizontal distance between A and B, and the elevation of B if the R.L of B.M is 418.685 m. the constants of the instruments were 100 and 0.3. [15]

7. (a) Draw a neat sketch of a simple circular curve and represent different elements of it.
   (b) Establish the relation $\delta = \frac{1718.9C}{R}$ minutes
   where δ = deflection angle of the chord; C = length of chord. R= Radius of the curve,
   (c) Calculate the perpendicular offsets at 20m intervals along the tangents to set out first five pegs of a simple circular curve of 250m radius. [4+4+7]

8. (a) Describe Geodetic Survying ? When do you go for the Geodetic Survey.
   (b) Describe the spatial models available in Geographical Information System. [8+7]

⋆ ⋆ ⋆ ⋆ ⋆

Code No: R21015/R10 **Set No. 2**

II B.Tech I Semester Regular Examinations, November 2012
SURVEYING
(Civil Engineering)

Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) a) Explain clearly the points of difference between the prismatic compass and Surveyor's compass.
   (b) What are the sources of errors in compass Surveying and what precautions are to be taken to eliminate them. [8+7]

2. (a) Explain
   i) Whole circle and Reduced bearing and
   ii) Fore and Back bearings of a Line.

   (b) The following bearings were taken in traversing with a compass. Locate the local attraction and determine corrected bearings.

Line	F.B	B.B
AB	$S45^0 30'E$	$N45^0 30'W$
BC	$S60^0 00'E$	$N60^0 40'W$
CD	$S5^0 30'E$	$N3^0 20'W$
DA	$N80^0 30'W$	$S82^0 00'E$

   [8+7]

3. A level set up on extended line BA in a position 70m from A and 100m from B reads 1.684 m on a staff held at A and 2.122 on a staff held at B, the bubble having been carefully brought to the center of its run before each reading. The R.Ls of the tops of pegs A and B are 89.620 and 89.222m respectively. Find
   (a) the collimation error, and
   (b) the readings that would have been obtained had there been no collimation error. [15]

4. The areas enclosed by various contours on the upstream side of a dam are given below. Determination.
   (a) the capacity of the reservoir if the full reservoir level (FRL) is 125m.
   (b) the elevation of the water surface when the reservoir is half-full. Ignore the volume below R.L. 100m. [8+7]

Contour(m)	100	105	110	115	120	125
Area(ha)	3	8	10	15	20	25

5. (a) State what errors are eliminated by repetition method. How will you set out a horizontal angle by method of repetition?

(b) Discuss the procedure of measuring horizontal angle with a theodolite? [8+7]

6. The following readings were taken on a vertical staff with a tacheometer fitted with an analytic lens:

Staff station	Bearing	Vertical angle	Staff reading
A	$34^0 20'$	$+11^0$	0.850 1.410 1.970
B	$202^0 50'$	-4^0	0.755 1.885 3.015

The value of k for the instrument is 100, calculate the difference of level between A and B and the distance AB. [15]

7. (a) What is meant by degree of curve. Derive its relationship with radius of curve.

(b) If the tangents to a circular curve having 500m radius intersect at an angle of 120^0 and the chainage of point of intersection is 1520.5m, calculate the different elements of a simple circular curve. [6+9]

8. (a) Define geographic information system and describe the relationship between traditional analog map and Geographic Information System.

(b) Suggest possible users of a GIS and how it might benefit them. [8+7]

⋆ ⋆ ⋆ ⋆ ⋆

Code No: R21015/R10 **Set No. 3**

II B.Tech I Semester Regular Examinations, November 2012
SURVEYING
(Civil Engineering)

Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Describe different types of chains and tapes commonly used in Surveying stating the advantages of each.
   (b) Describe in detail how you would range and chain a line between two points which are not intervisible because of an intervening hillock. [8+7]

2. (a) Explain the terms : Check Line, Base Line, Tie Line, and oblique offset.
   (b) Find the maximum length of offset so that the displacement on paper from both sources of error does not exceed 0.2 mm given that the offset is measured with an accuracy of 1 in 25 and the scale is 1cm = 50m. [8+7]

3. (a) What do you understand by interpolation of contours? What is the assumption on which the methods of interpolation is based ? Name the different methods of interpolation.
   (b) Explain any 3 methods of interpolation. [8+7]

4. A road embankment 40m wide at the formation level with side slopes .1 to1 and with an average height of 15m is constructed with an average gradient of 1in 40 from the contour of 150m to 590m. The ground has an average slope of 10 to 1 in the direction transverse to the centre line. Find the
   (a) length of the road
   (b) volume of embankment. [15]

5. (a) Define the following terms associated with the angle measurements with a Theodolite:
      i. Vertical axis
      ii. Trunnion axis
      iii. Axis of plate level
      iv. Centering.
   (b) Can you use a theodolite as levelling instrument? If so, how? [11+4]

6. (a) Describe the conditions under which tacheometric surveying is advantageous. Explain how you will obtain in the field the constants of a tacheometer.
   (b) Following observations were taken from two traverse stations by means of a tacheometer fitted with anallactical lens. The multiplying constant of the instrument is 100. compute the length and gradient of the line ST

Inst. Station	Staff station	Ht of Inst.	Bearing	Vertical angle	Staff reading in units
P	S	1.31	$226^0 30'$	$+10^0 12'$	0.765, 1.595, 2.425
Q	T	1.42	$84^0 45'$	$-12^0 30'$	0.820, 1.840, 2.860

Co-ordinates of station P are 212.3 N and 186.8 W units. Co-ordinate of station Q are 102.8N and 96.4 W units. Assume P and Q to be at the same level. [6+9]

7. (a) Draw a neat sketch of a simple circular curve and represent different elements of it.

   (b) Establish the relation $\delta = \frac{1718.9C}{R}$ minutes
   where δ = deflection angle of the chord; C = length of chord. R= Radius of the curve,

   (c) Calculate the perpendicular offsets at 20m intervals along the tangents to set out first five pegs of a simple circular curve of 250m radius. [4+4+7]

8. (a) Describe Geodetic Survying ? When do you go for the Geodetic Survey.

   (b) Describe the spatial models available in Geographical Information System. [8+7]

⋆ ⋆ ⋆ ⋆ ⋆

Code No: R21015/R10 **Set No. 4**

II B.Tech I Semester Regular Examinations, November 2012
SURVEYING
(Civil Engineering)

Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Describe different types of chains and tapes commonly used in Surveying stating the advantages of each.
   (b) Describe in detail how you would range and chain a line between two points which are not intervisible because of an intervening hillock. [8+7]

2. (a) Explain the procedure of chaining. How will you record the measurements of Chain Survey. Enumerate the points to be kept in view while booking the field notes.
   (b) A Survey line BAC crosses a river, A and C being on the near and opposite banks respectively. A perpendicular AD 40m long is set out at A. If the bearings of AD and DC are $38^0\ 45^1$ and $278^0\ 45^1$ respectively and the chainage at A is 862m. find the chainage at C. [8+7]

3. A level set up on extended line BA in a position 70m from A and 100m from B reads 1.684 m on a staff held at A and 2.122 on a staff held at B, the bubble having been carefully brought to the center of its run before each reading. The R.Ls of the tops of pegs A and B are 89.620 and 89.222m respectively. Find
   (a) the collimation error, and
   (b) the readings that would have been obtained had there been no collimation error. [15]

4. A railway embankment, 500m long has a width at formation level of 9m with side slopes of 2 to1. The ground levels at every 100m along the center line are given below. The embankment has a listing gradient of 1.2m per 100m and the formation level is 110.5 at zero chainage. Assuming the ground to be level across the centre line, compute the volume of earthwork. [15]

Distance(m)	0	100	200	300	400	500
Ground level(m)	107.8	106.3	110.5	111	110.7	112.2

5. What is Gale's traverse table? Discuss the procedure for recording the various entries in the table. [15]

6. A tacheometer is used to obtain the difference of levels between two points A and B. The instrument is set up at another station C, and the following observations were taken.

Staff	Vertical angle	Stadia readings
A	$-6^0 30'$	3.50, 2.815, 2.130
B	$-8^0 30'$	1.870, 0.990, 0.110

If the R.L of A is 100.0000, determine the R.L of B. also determine the horizontal distance of A from C. Take k=50.0 and C=0.50 [15]

7. (a) Why are the curves provided. Explain different types of curves with neat sketches.

   (b) Two straights intersect at a chainage of 3500.5m with an angle of intersection of 156^0. These two straights are to be connected by a simple circular curve of 200m radius. Calculate the data necessary by the method of offsets from the chords produced with a peg interval of 20m. Explain the procedure to set out the curve. [8+7]

8. Explain about the segments of Global Positioning system? [15]

⋆ ⋆ ⋆ ⋆ ⋆

Code No: R21025 **R10** SET - 1

II B. Tech I Semester, Regular Examinations, Nov – 2012
ELECTRICAL MACHINES -1
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~

1. a) Explain briefly about singly-excited and doubly-excited systems with suitable examples.
   b) Explain the mechanical energy and work done in singly excited system when actual displacement occurs?

2. a) Explain the function of commutator in a D.C. generator.
   b) Design a 4-pole, simplex lap winding suitable for an armature containing 20 slots. Assume single turn coils with 2 conductors per slot.

3. a) What is the purpose of using an interpole in a dc machine? Why an interpole winding is connected in series with armature?
   b) A 500 V, wave-wound, 750 rpm shunt generator supplies a load current of 195 A. The armature has 720 conductors and shunt field resistance is 100 Ω. Find the demagnetizing ampere-turns/pole if the brushes are advanced through 3 segments at this load. Also calculate the extra shunt field turns required to neutralize this demagnetization.

4. a) It is found that the voltage of a dc shunt generator does not build up. Explain the various possible causes of this failure.
   b) A series generator having a combined armature and field resistance of 0.4 Ω is running at 1,000 r.p.m. and delivering 5.5 kW at a terminal voltage of 110V. If the speed is raised to 1500 r.p.m. and load adjusted to 10kW, Find the new current and terminal voltage. Assume the machine is working on the straight line portion of the magnetization characteristic.

5. a) What is the necessity for parallel operation of generators? Why cross connection of field windings is done in compound generators?
   b) Two shunt generators are running in parallel. The no load voltage of each generator is 120 V. Generator 1 is rated at 250 kW and its full-load voltage is 115 V. Generator 2 is rated at 200 kW at 112 V. If the load supplied is 3600 A, calculate: (i) bus bar voltage (ii) output current of each generator.
~~~~~~~~~~~~~~~~~~~~~~~~

6. a) Explain speed-current, speed-torque and torque-current characteristics of a series motor.
   b) A 400 V dc shunt motor takes 5 A at no-load. Its armature resistance (including brushes) is 0.5 Ω and shunt field resistance is 200 Ω. Estimate the kW output and efficiency when the motor takes 50 A on full load.

7. a) Explain field flux control method for speed control of a dc machine. Also discuss its limitations.
   b) A dc series motor drives a fan at 800 rpm and takes 20 A when fed from rated voltage of 230 V. The motor resistance is 0.4 Ω. The motor speed is to be raised to 1000 rpm by voltage control. Find the voltage and current in case magnetic circuit is (i) saturated and (ii) unsaturated.

8. a) Explain how rotational losses can be estimated using retardation test.
   b) The Hopkinson's test on two dc shunt machines gave the following results for full load. Line voltage 250 V, line current excluding field current is 50 A, motor armature current is 38 A, motor field current is 4.2 A and generator field current is 5 A. Armature resistance of each machine is 0.002 Ω. Calculate the efficiency of each machine.

Code No: R21025 **R10** SET - 2

II B. Tech I Semester, Regular Examinations, Nov – 2012
ELECTRICAL MACHINES -1
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~

1. a) What is the significance of energy and co-energy in energy conversion system.
   b) A solenoid relay is operated from a 110 V dc supply and the 5000-turn coil resistance is 5.5 kΩ. The core diameter of the relay is 20 mm and the gap length is 1.5 mm, the armature being stationary. The gap faces may be taken as parallel and the permeability of the ferromagnetic parts are very high. Find (i) the gap flux density (ii) the coil inductance and (iii) the pull on the armature.

2. a) Draw neat diagram of a 4-pole dc machine. Label all its parts and mention the material used for each part.
   b) A long-shunt compound generator delivers a load current of 50 A at 500 V, and the resistances of armature, series field and shunt fields are 0.05 Ω, 0.03 Ω and 250 Ω respectively. Calculate the generated emf and the armature current. Allow 1.0 V per brush for contact drop.

3. a) What is meant by armature reaction? Show that the effect of armature mmf on the main field is entirely cross-magnetizing.
   b) A compensated generator has an interpole air gap of 0.011 m and a flux density in the interpole air gap of 0.4 T. The ratio of pole arc to pole pitch is 0.66. If armature ampere-turns per pole are 16500, determine the ampere turns per pole for the compensating winding and for the interpole winding.

4. a) Explain the nature of magnetization, external and internal characteristics of a dc shunt generator. Why does the external characteristic of this generator turn back as the generator is overloaded?
   b) The following data pertain to the magnetization curve of a dc shunt generator at 800 r.p.m.

I_f in Amps	0	0.2	0.4	0.65	1.02	1.75	3.15	5.00
E_G in Volts	10	40	80	120	160	200	240	260

   Determine i) critical field resistance at 800 and 900 rpm
   ii) If the field winding resistance is 55 Ω, find the range of field rheostat to vary the voltage from 200 to 250 V, on open circuit at a speed of 800 rpm.
~~~~~~~~~~~~~~~~~~~~~~~~

5. a) Enumerate the reasons for paralleling dc generators. What important conditions must be fulfilled before a shunt generator is connected in parallel with another?
   b) Two 220 V generators operate in parallel. One machine has terminal voltage of 260 V on no-load and 220 V when supplying 30 A. The second machine has a voltage of 270 V on no-load and 220 V when supplying 45 A. Calculate:
   (i) the output voltage (ii) current and (iii) output in kW of each machine when total current is 65 A. Assume the external characteristics to be rectilinear.

6. a) Prove that in a dc generator, generated emf and current in a conductor are in the same direction, whereas in a dc motor, generated emf opposes the flow of current in a conductor.
   b) A 60 kW, 250 V shunt motor takes 16 A when running light at 1440 rpm. The resistance of the armature and field are 0.2 Ω and 125 Ω respectively when hot. (i) Estimate the efficiency of the motor when taking 152 A. (ii) Also estimate the efficiency if working as a generator and delivering a load current of 152 A at 250 V.

7. a) Explain the necessity of a starter for a dc motor? Also explain the operation of a four point starter.
   b) A dc shunt motor is operated from 300 V mains. Its no-load speed is 1200 rpm. When fully loaded, it delivers a torque of 400 N-m and its speed drops to 1,100 rpm. Find its speed and power output when delivering the same torque if operated with an armature voltage of 600 V. Excitation is assumed to be unchanged.

8. a) Describe Swinburne's test with the help of a neat diagram to find out the efficiency of a dc machine.
   b) A field test on two similar series machines gave the following data:
   Motor: armature current = 60 A, voltage across armature = 500 V, voltage across field = 40V.
   Generator: terminal voltage = 450 V, output current = 46 A, voltage across field = 40 V.
   Armature resistance (including brushes) of each machine is 0.25 Ω. Calculate efficiency of both the machines.

Code No: R21025 **R10** SET - 3

II B. Tech I Semester, Regular Examinations, Nov – 2012
ELECTRICAL MACHINES -1
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) Explain briefly an electromechanical energy conversion device with the help of a block diagram.
   b) Derive expressions of field energy and co-energy in a singly-excited electromechanical unit.

2. a) Why is a commutator and brush arrangement necessary for operation of a dc machine?
   b) A six pole lap wound dc armature has 70 slots with 20 conductors / slot. The ratio of pole arc to pole pitch is 0.68. The diameter of bore of the pole shoe is 0.46 m. The length of the pole shoe is 0.3 m. If the air gap flux density is 0.3 Wb/m^2 and the e.m.f induced in the armature is 500 V, find the speed at which it runs.

3. a) What is reactance voltage? How is it neutralized in a DC machine?
   b) A 2000 kW, 400 V, 14-pole DC machine has a lap wound armature with 1100 conductors. The pole arc to pole-pitch ratio is 0.7. Compute the number of pole-face conductors of the compensating winding in each pole, so as to obtain uniform air-gap flux density under the pole faces.

4. a) Explain the procedure to obtain magnetization, external and internal characteristics of a series generator.
   b) A 60 kW DC shunt generator has 1600 turns/pole in its shunt winding. A Shunt field current of 1.25A is required to generate 125V at no load and 1.75A to generate 150V at full load. Calculate
   i) The minimum number of series turns/pole needed to produce the required no load and full load voltage as a short-shunt compound generator.
   ii) If the generator is equipped with three series turns/pole having a resistance of 0.02 Ω , calculate diverter resistance required to produce the desired compounding
   iii) Voltage regulation of compound generator
~~~~~~~~~~~~~~~~~~~~~~~~~

5. a) Explain clearly why an equalizer connection makes it possible for two compound generators to operate in parallel in stable equilibrium.
   b) Two compound generators G1 and G2 (fitted with an equalizing bar) operating in parallel supply a load of 475 A. The data of these generators are as follows:

	G1	G2
Generated e.m.fs., V	250	254
Series field resistance, ohm	0.004	0.006
Armature resistance, ohm	0.02	0.04

   Determine: i) Current in each armature ii) Current in each series winding iii) The current flowing in the equalizing bar iv) The bus bar voltage
   Neglect the shunt field currents.

6. a) Explain the speed-current, torque-current and speed-torque characteristics of a cumulative compound d.c motor.
   b) A 6-pole, 500- V wave- connected shunt motor has 1200 armature conductors and useful flux/pole of 20 mWb. The armature and field resistance are 0.5 Ω and 250 Ω respectively. What will be the speed and torque developed by the motor when it draws 20 A from the supply mains? Neglect armature reaction. If magnetic and mechanical losses amount to 900 W, find (i) useful torque (ii) output in kW and (iii) efficiency at this load.

7. a) Why is a resistor required in series with the armature of a DC motor at the time of stating? Describe a suitable starter for starting a DC shunt motor having No-volt and overload protections.
   b) A 240V shunt motor has an armature current of 15 A when running at 800 rpm against full-load torque. The armature resistance is 0.6 Ω. What resistance must be inserted in series with the armature to reduce the speed to 400 rpm at the same torque? What will be the speed if the load torque is halved with this resistance in the circuit? Assume flux to remain constant throughout.

8. a) Explain how Hopkinson's test is carried out on a d.c machine to find its efficiency.
   b) A 400 V, 20 kW dc shunt motor takes 2.5 A when running light. For an armature resistance of 0.5 Ω, field resistance of 800 Ω and brush drop of 2 V, find the full-load efficiency.

Code No: R21025 **R10** SET - 4

II B. Tech I Semester, Regular Examinations, Nov – 2012
ELECTRICAL MACHINES -1
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) For a singly excited magnetic system, derive the relation for the magnetic stored energy in terms of reluctance.

   b) The λ-i relationship for an electromagnetic system is given by $i = \left(\frac{\lambda_g}{0.09} \right)^2$ which is valid for the limits 0<i<4 A and 3<g<10 cm. For current i = 3 A and air gap length g= 5 cm, find the mechanical force on the moving part using energy and co-energy of the field.

2. a) Explain the principle of operation of a d.c. generator and derive its emf equation.
   b) An 8-pole lap wound generator armature has 960 conductors, a flux of 40 mWb and a speed of 400 r.p.m. Calculate the e.m.f generated on open circuit. If the same armature is wave wound, at what speed must it be driven to generate 400 volts?

3. a) Explain clearly the function of interpoles and compensating windings in a dc machine.
   b) A 6-pole lap connected d.c generator having a commutator ring of diameter 45 cm runs at 1000 r.p.m. The brush width is 2 cm and thickness of mica insulation is 0.2 cm. The load current delivered by generator is 115 A and the shunt field current is 5 A. The self-inductance of each coil is 0.1 mH. Determine the reactance voltage if commutation is linear.

4. a) Explain the procedure to obtain O.C.C of a compound generator.
   b) The following data pertains to the magnetization curve of a D.C shunt generator at 300 r.p.m.

I_f in Amps	0	0.2	0.3	0.4	0.5	0.6	0.7
E_G in Volts	7.5	93	135	165	186	202	215

   The field resistance of the machine is adjusted to 354.5 Ω and the speed is 300 rpm.
   For this generator,
   i) Determine the no-load generated voltage.
   ii) Determine the critical value of the shunt field resistance.
   iii) Determine the critical speed for the given shunt field resistance.
~~~~~~~~~~~~~~~~~~~~~~~~~

5. a) Explain carefully the exact procedure for connecting a compound generator in parallel with another compound generator already supplying a load.
   b) Explain how internal and external characteristics are obtained for a d.c. compound generator. Also explain why differential compound generator is not preferred over other d.c. generators.

6. a) Explain he significance of Back emf in DC motors.
   b) A 200 V shunt motor has armature resistance = 0.1 Ω, shunt field resistance = 240 Ω and rotational loss = 236 W. On full load the line current is 9.8 A with the motor running at 1450 rpm. Determine
   (i) The mechanical power developed (ii) The power output
   (iii) The load torque (iv) The full-load efficiency

7. a) Explain with circuit diagram the armature voltage control method of speed control in dc motors.
   b) A 20 kW, 500 V shunt motor has an efficiency of 90 % at full-load. The armature copper loss is 40 % of the full-load loss. The field resistance is 250 Ω. Calculate the resistance values of a 4-section starter suitable for this motor if the starting current is limited to two times full load current.

8. a) Explain the procedure to conduct Field's test on series machines in order to determine efficiency.
   b) Hopkinson's test was used to test two shunt machines. The supply current was 15 A at 200 V. The generator output current was 85 A. The field currents for motor and generator were 2.5 A and 3 A respectively. The armature resistance of each machine was 0.05 Ω. Find the efficiency of each of the machines under the above loading conditions.

Code No: R21032 **R10** SET - 1

II B. Tech I Semester, Regular Examinations, Nov – 2012
THERMODYAMICS
(Com. to ME, AE, AME, MM)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~

1. a) What are different thermodynamic systems? Give example for each type with justification.
   b) A mass of 1 kg of air contained in a closed vessel at 1 bar, 300 K is stirred with a constant torque of 1 N-m at a speed of 1000 RPM till the volume doubles at constant pressure. The initial and final temperatures were found to be the same. If 10 kJ of heat is absorbed during the experiment, calculate its duration.

2. a) Define Internal Energy and show that internal energy is a property of the system.
   b) Air flows steadily at the rate of 0.4 kg/s through an air compressor, entering at 6 m/s with a pressure of 1 bar and a specific volume of 0.85 m^3/kg, and leaving at 4.5 m/s with a pressure of 6.9 bar and specific volume of 0.16 m^3/kg. The internal energy of air leaving is 88 kJ/kg greater than that of air entering. Cooling water in a jacket surrounding the cylinder absorbs heat from the air at the rate of 59 W. Calculate the power required to drive the compressor and cross sectional areas of inlet and outlet.

3. a) What is Clausius Inequality? Explain the Principle of Increase of Entropy for an adiabatic system.
   b) 1 kg of steam at 5 bar and 200^0C in a closed system is first mixed adiabatically with 1 kg of saturated water at 5 bar. The mixture is then cooled at constant volume by heat loss to atmosphere at 300 K till its final state is 1 bar, 0.55 dry. Calculate the irreversibility.

4. a) A large insulated vessel is divided into two chambers, one containing 5 kg of dry saturated steam at 0.2 MPa and the other 10 kg of steam, 0.8 quality at 0.5 MPa. If the partition between chambers is removed and the steam is mixed thoroughly and allowed to settle, find the final pressure, steam quality and the entropy change in the process.
   b) Using TdS equations and Maxwell's relations, obtain the expression for Clausius – Clapeyron Equation.
~~~~~~~~~~~~~~~~~~~~~~~~

5. a) Explain how the real gas behavior is captured using Vander Waal's Equation of State. What are modifications done to Ideal Gas Equation of State?

   b) 0.5 kg of Helium and 0.5 kg of Nitrogen are mixed at 20^0C and at a total pressure of 100 kPa. Find the

      i) Volume of the mixture,

      ii) The partial pressures of the constituent gases,

      iii) The mole fractions of the components,

      iv) The specific heats of the mixture and

      v) Gas constant of the mixture.

6. a) With the help of a schematic diagram, explain how the adiabatic saturation temperature is obtained.

   b) Air at 40^0C DBT and 27^0C WBT is to be cooled and dehumidified by passing it over a cooling coil to a give a final condition of 15^0C and 90% RH. Find the amount of heat moisture removed per kg of dry air.

7. a) For the air standard Brayton cycle, show that the thermal efficiency if a function of pressure ratio.

   b) In an air standard Otto cycle, the compression ratio is 7 and the compression begins at 35^0C, 0.1 MPa. The maximum temperature in the cycle is 1100^0C. Find i) Cycle efficiency and ii) Mean Effective Pressure of the cycle.

8. Write short notes on the following:

   a) Thermodynamic analysis of Throttling Process (Make necessary assumptions)

   b) Vapour Compression Refrigeration Cycle

   c) Absolute temperature scale

Code No: R21032 **R10** SET - 2

II B. Tech I Semester, Regular Examinations, Nov – 2012
THERMODYAMICS
(Com. to ME, AE, AME, MM)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~

1. a) Establish the First Law of Thermodynamics from the Joule's Experiment.
   b) Briefly explain the macroscopic and microscopic view points.
   c) The energy in Joule (J) of a closed system can be expressed as $E=100+50T+0.04\ T^2$. The heat absorbed is given by Q (in Joule) = 5000 + 20 T. Temperature is in K. Calculate the work done during a process when the temperature rises from 500 K to 1000 K.

2. a) State and prove Carnot's theorem.
   b) A house is to be maintained at a temperature of 20^0C by means of a heat pump pumping heat from the atmosphere. Heat losses through the walls of the house are estimated at 0.65 kW per unit of temperature difference between the inside of house and atmosphere.
   i) If the atmospheric temperature is -10^0C, what is the minimum power required to drive the pump? ii) It is proposed to use the same heat pump to cool the house in the summer. For the same room temperature, the same heat loss rate, and the same power input to the pump, what is the maximum permissible atmospheric temperature?

3. Calculate the changes of entropy per kg of air in the following cases:
   i) Air expands isothermally from 6 bar to 3 bar
   ii) Air is compressed to half the volume at constant pressure and
   iii) Heat is supplied to air at constant volume till the pressure becomes three fold
   What would be the change in entropy of the air undergoes the above three processes in sequence. Take C_p = 1.005 kJ/kgK and C_v = 0.720 kJ/kgK.

4. a) Using the Maxwell's relations, obtain the expression for the difference of specific heats at constant pressure and constant volume in terms of the derivatives of properties. Hence show that $C_p - C_v$ is always positive.
   b) With the help of a schematic diagram, explain the measure of steam quality using the separating and throttling calorimeter.
~~~~~~~~~~~~~~~~~~~~~~~~

5. a) Explain the law of corresponding states. Hence briefly explain the significance of compressibility chart.

   b) Two vessels A and B, each of volume 3 m^3 may be connected together by a tube of negligible volume. Vessel A contains air at 7 bar, 95^0C and vessel B contains air at 3.5 bar , 205^0C. Find the change of entropy when A is connected to B. Assume the mixing to be complete and adiabatic.

6. a) Define the following properties: i) Humidity Ratio ii) Dew Point temperature and iii) Relative humidity

   b) Cooling water enters the cooling tower at a rate of 1000 kg/h and 70^0C. Water is pumped from the base of the tower at 24^0C and some makeup water is added afterwards. Air enters the tower at 15^0C, 50% RH, 1.01325 bar and leaves the tower saturated at 34^0C, 1 bar. Calculate the flow rate of dry air in kg/h and the makeup water required per hour.

7. a) An engine working on Otto cycle has an air standard efficiency of 56% and rejects 544 kJ/kg of air. The pressure and temperature of air at the beginning of compression are 0.1 MPa and 60^0C respectively. Compute i) the compression ratio of the engine and b) maximum pressure in the cycle.

   b) Explain the simple Rankine cycle with the help of a schematic and T-S diagram.

8. Write short notes on the following

   a) Clausius Inequality

   b) Clausius – Clapeyron Equation

   c) Equivalence of Clausius and Kelvin-Plank statements of Second law of Thermodynamics

Code No: R21032 **R10** SET - 3

II B. Tech I Semester, Regular Examinations, Nov – 2012
THERMODYAMICS
(Com. to ME, AE, AME, MM)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) What is Thermal Equilibrium and hence define Zeroth Law of Thermodynamics.
   b) Define Point and Path functions. Give one example for each.
   c) 3 kg of air in a rigid vessel at 5 bar and 100^0C is stirred till the pressure reaches 15 bar. Meanwhile, the air absorbs 200 kJ of heat. Calculate the final temperature and stirrer work.

2. a) Show that the absolute temperature scale is independent of working fluid.
   b) Two streams of air, one at 1 bar, 27^0C and velocity of 30 m/s and the other at 5 bar, 227^0C and velocity of 50 m/s mix in equal proportion in a chamber from which heat at the rate of 100 kJ/kg is removed. The mixture is then passed through an adiabatic nozzle. Find the velocity of the stream issuing out of the nozzle. The temperature of the air leaving the nozzle is 27^0C and its C_p = 1.005 kJ/kgK

3. a) Show that the thermal efficiency of reversible engine operating between two heat reservoirs is greater than that of an irreversible engine.
   b) 1 kg of ice at -10^0C is exposed to the atmosphere which is at 25^0C. The ice melts and comes in contact with the atmosphere. i) Determine the entropy increase of the universe, ii) What is the minimum amount of work necessary to convert the water back into ice at -10^0C? C_p of ice is 2.093 kJ/kgK and the latent heat of fusion of ice is 333 kJ/kg.

4. a) Explain the measurement of steam quality using the separating and throttling calorimeter by means of schematic diagram.
   b) Obtain the expression for Joule-Kelvin coefficient for an ideal gas undergoing Joule – Thomson expansion.
~~~~~~~~~~~~~~~~~~~~~~~~~

5. a) Show that for an ideal gas, the slope of constant volume line on T-S diagram is more than that of constant pressure line.
   b) A closed rigid and insulated vessel is divided by a diaphragm into two equal compartments, each of volume 0.1 m^3. Each compartment contains air at a temperature of 20^0C. The pressure in one compartment is 2.5 MPa and in other compartment is 1 MPa. The diaphragm is ruptured so that the air in both the compartments mixes to reach a uniform pressure throughout the cylinder. Find the net change of entropy for the mixing process.

6. a) What is the significance of Psychrometric chart? Represent the following processes on the Psychrometric chart: i) Sensible heating, ii) Adiabatic dehumidification and iii) Latent heat removal.
   b) The moist air enters the heater-humidifier unit at 5^0, 100 kPa, 50% RH. The flow rate of dry air is 0.1 kg/s. Liquid water at 10^0C is sprayed into the mixture at the rate of 0.002 kg/s. The mixture leaves the unit at 30^0C, 10 kPa. Calculate the relative humidity at the outlet and the rate of heat transfer.

7. a) With the help of P-V and T-S diagrams, compare the Otto, Diesel and Dual cycles for the same maximum pressure and the temperature.
   b) In a gas turbine plant with air at the inlet of the compressor is at 0.1 MPa, 30^0C. The pressure ratio is 6 and the maximum temperature in the cycle is 900^0C. Find the cycle efficiency and net work. If the pressure ratio is increased to 10, for the same maximum temperature, calculate the cycle efficiency and the net work. Comment on the result.

8. Write short notes on the following:
   a) First law of Thermodynamics applied to a process in a closed system and to an open system
   b) Adiabatic saturation temperature

Code No: R21032 **R10** SET - 4

II B. Tech I Semester, Regular Examinations, Nov – 2012
THERMODYAMICS
(Com. to ME, AE, AME, MM)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) What are different modes of Work? Explain any two of them with the help of relevant State – Space diagram.
   b) Briefly explain the concept of Continuum.
   c) 5 kg of steam at 5 bar, 0.5 dry, contained in a closed rigid system is adiabatically stirred till the steam becomes dry and saturated. If the stirrer delivers a torque of 1 N-m and its speed is 1000 RPM, calculate the time for which the stirrer should be on.

2. a) Explain the First Law of Thermodynamics applied to a process in a closed system. Make necessary assumptions
   b) A heat engine drives a heat pump. The heat delivered by the heat engine as well as by the pump is used to heat the water circulating through the heat radiators of a building. The efficiency of the heat engine is 27% and the coefficient of performance of heat pump is 4. Calculate the ratio of heat transferred to the circulating water to the heat taken by the heat engine.

3. An aluminium block (C_p = 400 J/kgK) with a mass of 5 kg is initially at 40^0C in a room with air at 20^0C. It is cooled reversibly by transferring heat to a completely reversible cyclic heat engine until the block reaches 20^0C. The room serves as the constant temperature heat sink for the engine. Compute the change in entropy of the block, change in entropy of the room and work done by the engine.If the aluminium block is allowed to cool by natural convection to room air, compute the change in entropy of the block, change in entropy of the room and change in entropy of the universe.

4. a) Using the Maxwell's relations, Obtain the expression for the difference of specific heats at constant pressure and constant volume in terms of the derivatives of properties. Hence obtain its expression for an ideal gas.
   b) A rigid closed tank of volume 3 m^3 contains 5 kg of wet steam at a pressure of 200 kPa. The tank is heated until the steam becomes dry saturated. Determine the final pressure and heat transfer to the tank.
~~~~~~~~~~~~~~~~~~~~~~~~~

5. a) A gaseous mixture consists of 1 kg of oxygen and 2 kg of nitrogen at a pressure of 150 kPa and a temperature of 20^0C. Determine the changes in internal energy, enthalpy and entropy when the mixture is heated to a temperature of 100^0C, i) at constant volume and ii) at constant pressure.
   b) Relative merits of Ideal gas equation of state and the Vander Waal's equation of state.

6. a) Explain working of cooling tower and hence write the energy and mass balance equations for water and air undergoing heat and mass interactions.
   b) Two streams of air, one at 25^0C, 50% RH and other at 25^0C and 60% RH are mixed adiabatically to obtain 3 kg of dry air at 30^0C. Calculate the air drawn from both the streams and the humidity ratio of the mixed air.

7. a) Show that for an Otto cycle, the thermal efficiency is a function of compression ratio and show the variation of efficiency with compression ratio.
   b) In an air standard Diesel cycle, the compression ratio is 15. The compression begins at 0.1 MPa, 40^0C. The heat added is 1.675 MJ/kg. Find i) Maximum temperature in the cycle, ii) Cycle efficiency, iii) Cut-off ratio and d) MEP of the cycle

8. Write short notes on any two of the following:
   a) Thermodynamic Analysis of Rankine Cycle by using schematic and T-S diagram
   b) Carnot cycle and its efficiency when used as reversible engine

Code No: R21044 **R10** SET - 1

II B. Tech I Semester, Regular Examinations, Nov – 2012
SIGNALS AND SYSTEMS
(Com. to ECE, EIE, ECC, BME)

Time: 3 hours Max. Marks: 75

Answer any FIVE Questions
All Questions carry Equal Marks
~~~~~~~~~~~~~~~~~~~~~~~~

1. a) A rectangular function is defined as

$$f(t) = \begin{cases} A \ \ for \ \ 0 \le t \le \dfrac{\pi}{2} \\ -A \ \ for \ \ \dfrac{\pi}{2} \le t \le 3\dfrac{\pi}{2} \\ A \ \ for \ \ 3\dfrac{\pi}{2} \le t \le 2\pi \end{cases}$$

Approximate above function by *A cost* between the intervals (0, 2π) such that mean square error is minimum.

b) Explain how a function can be approximated by a set of orthogonal functions.

2. a) Consider the periodic square wave x(t) as shown in Figure 1 given below. Determine the complex exponential Fourier series of x(t).

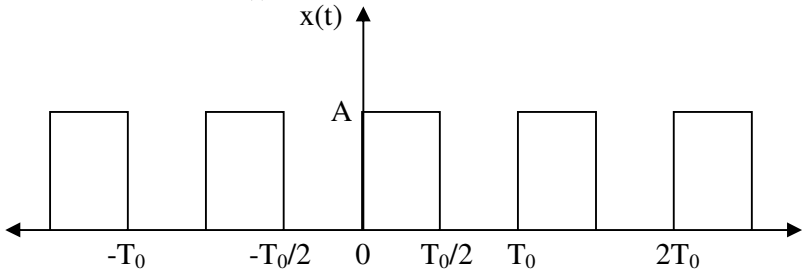


Figure 1

b) State and prove the following Fourier series properties.
i) Time differentiation ii) Frequency shift

3. a) Consider a continuous time LTI system described by $\dfrac{d\ y(t)}{dt} + 2y(t) = x(t)$. Using the Fourier transform, find the output y(t) to each of the following input signals:

i) $x(t) = e^{-t}u(t)$ ii) $x(t) = u(t)$

b) State and prove the following properties of Fourier transform:
i) Multiplication in time domain ii) Convolution in time domain
~~~~~~~~~~~~~~~~~~~~~~~~

4. a) The frequency response H(jω) of a causal LTI filter is shown in Figure 2 given below. Find the filtered output signal y(t) for the following input signals

i) $x(t) = \sin(\omega_0 t)u(t)$ ii) $x(j\omega) = \frac{1}{2 + j\omega}$

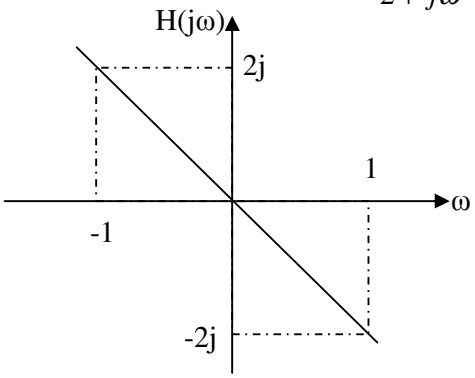


Figure-2

b) Given a continuous LTI system with unit impulse response h(t). A continuous time signal x(t) is applied to the input of this LTI system, where, $x(t) = e^{-at}u(t)$ for a>0 and $h(t) = u(t)$ and evaluate the output.

5. a) Compute the convolution sum y(n) to the following pair of sequences:

i) $x(n) = y(n), \text{h(n)} = 2^n u(-n)$ ii) $x(n) = \left(\frac{1}{2}\right)^n u(n), h(n) = \delta(n) - \frac{1}{2}\delta(n-1)$

b) State and prove convolution property of Fourier transforms.

6. a) Discuss sampling of continuous time signals.
b) Find the Nyquist rate and the Nyquist interval for the signal

$x(t) = \frac{1}{2\pi}\cos(4000\pi t)\cos(1000\pi t)$

7. a) A cosine wave cosωt is applied as the input to the series RL circuit shown in Figure 3 given below. Find the resultant current i (t) if the switch S is closed at t=0

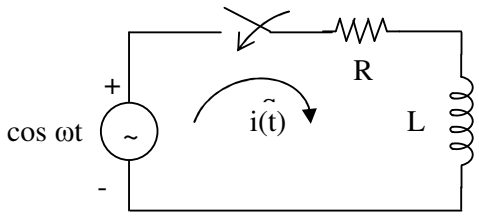


Figure-3

b) State and prove any four Laplace transform properties

8. a) The z-transform of a particular discrete time signal x(n) is expressed as

$X(z) = \frac{1 + 0.5z^{-1}}{1 - 0.5z^{-1}}$ Determine the x(n) using time shifting property.

b) State and prove any four z-transform properties.

Code No: R21044 **R10** SET - 2

II B. Tech I Semester, Regular Examinations, Nov – 2012
SIGNALS AND SYSTEMS
(Com. to ECE, EIE, ECC, BME)

Time: 3 hours Max. Marks: 75

Answer any FIVE Questions
All Questions carry Equal Marks
~~~~~~~~~~~~~~~~~~~~~~~~

1. a) Check whether the following signals are orthogonal or not

   $X_1(n) = e^{jk(\pi/8)n}$ *and* $X_2(n) = e^{jm(2\pi+\pi/8)n}$

   b) Define mean square error and derive the expression for evaluating mean square error.

2. a) Consider the periodic impulse train $\delta_{T0}(t)$ which is defined $\delta_{T0}(t) = \sum_{K=-\infty}^{\infty} \delta(t - KT_0)$

   Determine the complex exponential Fourier series.

   b) Explain the trigonometric Fourier series with necessary mathematical expressions

3. a) Find the Fourier transform of the signal $X(t) = \dfrac{\sin at}{\pi t}$

   b) Briefly explain the following terms:

   i) Hilbert transforms ii) Modulation theorem

4. a) What is an LTI system? Explain its properties.

   b) Find the impulse response of the system shown in the Figure 1 given below. Find the transfer function. What would be its frequency response? Sketch the response.

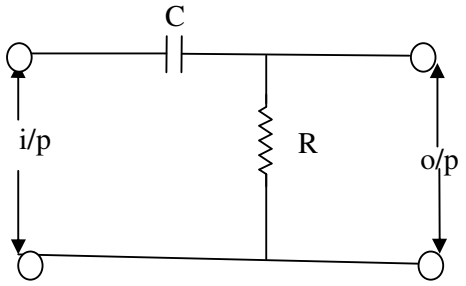


Figure 1
~~~~~~~~~~~~~~~~~~~~~~~~

5. a) *If* $y(t) = x(t) * h(t)$ then show that $x(t-t_1) * h(t-t_2) = y(t-t_1-t_2)$

   b) Derive an expression that relates energy spectral density and autocorrelation function.

6. a) A continuous time signal is given below: x(t) = 8 cos 200πt

   i) Minimum sampling rate

   ii) If f_s=400Hz, what is the continuous signal obtained after sampling

   iii) What is the frequency $0 < f < f_s / 2$ of sinusoidal that yields samples identical to those obtained in part (ii)

   b) State and explain Sampling theorem for continuous signals.

7. a) Discuss various properties of ROC's for Laplace transform.

   b) Determine the inverse Laplace transform of the following:

   i) $\frac{s^3 + 1}{s\,(s+1)\,(s+2)}$ ii) $\frac{s-1}{(s+1)\,(s^2+2s+5)}$

8. a) Using long division, determine the inverse Z-transform of

$$X(z) = \frac{1}{1 - \left(\frac{3}{2}\right) z^{-1} + \left(\frac{1}{2}\right) z^{-2}}$$

   b) State and prove the following properties

   i) Convolution property ii) Correlation property

   iii) Time shifting property iv) Time reversal property

Code No: R21044 **R10** SET - 3

II B. Tech I Semester, Regular Examinations, Nov – 2012
SIGNALS AND SYSTEMS
(Com. to ECE, EIE, ECC, BME)

Time: 3 hours Max. Marks: 75

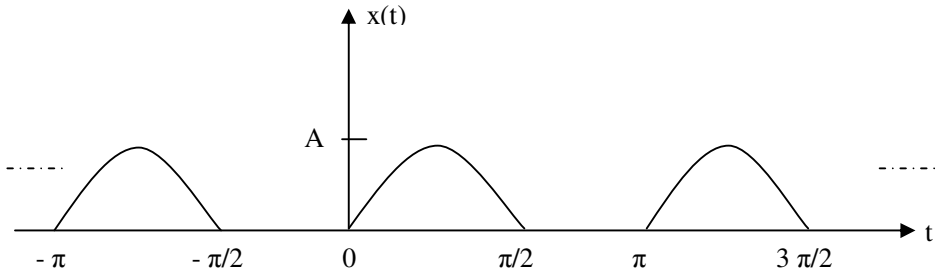
Answer any FIVE Questions
All Questions carry Equal Marks
~~~~~~~~~~~~~~~~~~~~~~~~

1. a) Prove the following signals are periodic and their fundamental period is $2\pi/\omega_0$

   i) $x(t) = e^{j\omega_0 t}$ ii) $x(t) = \cos(\omega_0 t + \theta)$

   b) Explain the concepts of impulse function, unit step function and signum function.

2. a) Find the Fourier series expansion of the half wave rectified sine wave shown below.



   b) Discuss the Drichlet conditions.

3. a) Show that $x(t)\cos\omega_0 t \leftrightarrow \frac{1}{2}X(\omega-\omega_0)+\frac{1}{2}X(\omega+\omega_0)$ and

$$X(t)\sin\omega_0 t \leftrightarrow -j\left[\frac{1}{2}X(\omega-\omega_0)-\frac{1}{2}X(\omega+\omega_0)\right]$$

   b) Find the fourier transform of the following signal.

$$Sgn(t) = \begin{cases} 1 & for\ t > 0 \\ -1 & for\ t < 0 \end{cases}$$
~~~~~~~~~~~~~~~~~~~~~~~~

4. a) What is Paley-Winer criterion? Explain its significance
   b) Determine the maximum bandwidth of signals that can be transmitted through low pass RC filter as shown in the Figure 1 given below, if over this bandwidth the gain variation is to be within 10% and the phase variation is to be within 7% of the ideal characteristics.

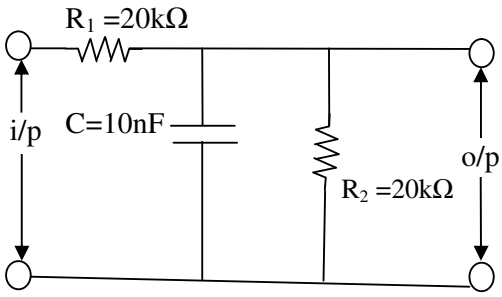


Figure 1

5. a) Discuss cross correlation and its properties.
   b) Find the power, rms value and sketch the PSD for the following signal.
   x(t) = (A+sin 100t) cos 200t

6. a) Determine the Nyquist rate for a continuous time signal
   x(t) = 6 cos50πt+20 sin 300πt+10 cos 100πt
   b) Explain the following terms:
   i) Natural sampling ii) Importance of sampling theorem

7. a) State and prove initial and final value theorem wrt Laplace transform
   b) Determine the Laplace transform of the following:
   i) x(t) = sin (at) cos (bt) ii) x(t) = Cos^3 3t iii) x(t) = t sin at

8. a) Determine the inverse Z-transform of the following X(z) by the partial fraction expansion method. $X(z) = \dfrac{z+2}{2z^2 - 7z + 2}$

   If the ROC's are

   i) $|z| > 3$ ii) $|z| < 1/2$ iii) $\dfrac{1}{2} < |z| < 3$

   b) Explain the differentiation property of Z-transform.

Code No: R21044 **R10** SET - 4

II B. Tech I Semester, Regular Examinations, Nov – 2012
SIGNALS AND SYSTEMS
(Com. to ECE, EIE, ECC, BME)

Time: 3 hours Max. Marks: 75

Answer any FIVE Questions
All Questions carry Equal Marks
~~~~~~~~~~~~~~~~~~~~~~~~

1. a) Discuss how an unknown function f(t) can be expressed using infinite mutually orthogonal function. Show the representation of a waveform f(t) using trigonometric Fourier series.
   b) Determine whether the following signals are energy signals, power signals or neither.
   i) $x(t) = A\cos(\omega_0 t + \theta)$ ii) $x(t) = e^{-at}u(t), a > 0$ iii) $x(t) = t\,u(t)$

2. a) Determine the complex exponential Fourier series representation for each of the following signals:
   i) $x(t) = \cos(2t + \pi/4)$ ii) $x(t) = \cos 4t + \sin 6t$ iii) $x(t) = \sin^2 t$
   b) Write short notes on "Complex Fourier Spectrum".

3. a) Prove the frequency convolution theorem that is $x_1(t)x_2(t) \leftrightarrow \frac{1}{2\pi} X_1(\omega) * X_2(\omega)$
   b) Find the inverse Fourier transform of the following:
   i) $X(\omega) = \frac{1}{(a + j\omega)^2}$ ii) $X(\omega) = \frac{1}{a - j\omega}$

4. a) Obtain the conditions for the distortion less transmission through a system. What do you understand by the term signal bandwidth & system bandwidth?
   b) Check whether the following systems are linear time invariant systems or not.
   i) y(t) = sin x(t) ii) y(t) = t x(t) iii) y(t) = x(t) cos 200 π iv) $y(t) = t\,e^{-2t}$
~~~~~~~~~~~~~~~~~~~~~~~~

5. a) Discuss the relation between convolution & correlation and briefly explain autocorrelation and its properties.

   b) For the signal $x(t) = e^{-at}\, u(t)$, find out the total energy contained in the frequency band $|f| \le W \ where \ W = a/2\pi$

6. a) Discuss different sampling techniques.

   b) Explain the effect of under sampling-aliasing.

7. a) Define Laplace transform. Distinguish between Laplace transform and continuous time Fourier transforms.

   b) Find the output response y(t) of the RC low pass network as shown in the Figure 1 given below due to the input $x(t) = t\, e^{-t/RC}$ by convolution.

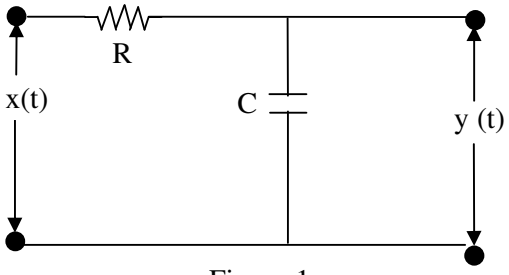


Figure 1

8. a) Determine the final value of the signal corresponding to the Z-transform

$$X(z) = \frac{2z^{-1}}{1 - 1.8z^{-1} + 0.8z^{-2}}$$

   b) Explain different properties of ROC of Z-transform.

Code No: R21054 **R10** SET - 1

II B. Tech I Semester, Regular Examinations, Nov – 2012
DIGITAL LOGIC DESIGN
(Com. to CSE, IT)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~

1. a) Construct a table for 4 -3 -2 -1 weighted code and write 9154 using this code
   b) Perform arithmetic operation indicated below. Follow signed bit notation:
      i) 001110 + 110010
      ii) 101011 - 100110.
   c) Explain the importance of gray code. (4M+8M+3M)

2. Convert each of the following to the other canonical form:
   a) $F(x,y,z) = \sum(2,5,6)$
   b) $F(A,B,C,D) = \pi (0,1,2,4,7,9,12)$ (6M+9M)

3. Simplify the following functions by first finding the essential prime implicants
   i) $F(w,x,y,z)= \sum(0,2,4,5,6,7,8,10,13,15)$
   ii) $F(w,x,y,z)= \sum(0,2,3,5,7,8,10,11,14,15)$ (7M+8M)

4. Design a full subtract or circuit with three inputs x, y, B_{in}, and two outputs D_{iff} and Bout. The circuits subtracts x-y- B_{in} , where Bin is the input barrow, B_{out} is the output borrow, and D_{iff} is the difference. (15M)

5. a) Implement the following functions on decoder logic
   $Y1= \Sigma (0,1,3,6,7)$, $Y2= \Pi (0,2,4,7)$, $Y3= \Pi (1,3,6,7)$
   b) Realize a full sub tractor using MUX. (7M+8M)

6. Implement the following functions on PLA
   $A (w,x,y,z) = \Sigma(0, 2, 6, 7, 8, 9, 12, 13)$
   $B (w,x,y,z) = \Sigma(0, 2, 6, 7, 8, 9, 12, 13, 14)$
   $C (w,x,y,z) = \Sigma(2, 3, 8, 9, 10, 12, 13)$
   $D (w,x,y,z) = \Sigma(1, 3, 4, 6, 9, 12, 14)$ (15M)

7. a) Define the following terms related to flip-flops.
      i) set-up time ii) hold time iii) propagation delay iv) preset and v) clear.
   b) Distinguish between combinational logic and sequential logic. (9M+6M)

8. Explain about the Following
   a) Serial addition in 4-bit shift register
   b) BCD Ripple Counter
   c) Universal Shift Register. (5M+5M+5M)
~~~~~~~~~~~~~~~~~~~~~~~~

Code No: R21054 **R10** SET - 2

II B. Tech I Semester, Regular Examinations, Nov – 2012
DIGITAL LOGIC DESIGN
(Com. to CSE, IT)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~

1. Express the following numbers in decimal:
   a) $\{10110.0101)_2$ b) $(l6.5)_{16}$
   c) $(26.24)_8$ d) $(FAFA)_{16}$
   e) $(1010.1010)_2$ (15M)

2. Implement the Boolean function
   F = xy + x'y' + y'
   a) With AND and inverter gates,
   b) With NAND and inverter gates,. and
   c) With NOR and inverter gates. (5M+5M+5M)

3. Simplify the following Boolean functions, using four variable maps:
   a) F(w, x, y, z) = ∑(1,4,5,6,12,14,15)
   b) F(A,B,C,D) = ∑(1,5,9,10,11,14,15)
   c) F(w, x,y,z) =∑ (0,1,4.5,6,7,8,9) (5M+6M+4M)

4. a) Design a 4 bit carry look ahead adder circuit.
   b) Design a 4 bit BCD adder using Full adder circuits (7M+8M)

5. a) Design a 2 bit comparator using gates.
   b) Implement the following functions on decoder logic
   i) Y1= Σ (0,1,3,6,7), Y2= Π (0,2,4,7), ii) Y3= Π (1,3,6,7) (6M+9M)

6. Tabulate the truth table for an 8 × 4 ROM to implement the following Boolean expression.
   A(x,y,z)= ∑ (3,6,7) B(x,y,z)= ∑ (0,1,4)
   C(x,y,z)= ∑ (2,6) D(x,y,z)= ∑ (0,2,5,6) (4M+4M+4M+3M)

7. Explain the design of Sequential circuit with an example. Show the state reduction, state assignment. (15M)

8. a) Draw and explain 4-bit universal shift register.
   b) Explain different types of shift registers. (7M+8M)
~~~~~~~~~~~~~~~~~~~~~~~~

Code No: R21054 **R10** SET - 3

II B. Tech I Semester, Regular Examinations, Nov – 2012
DIGITAL LOGIC DESIGN
(Com. to CSE, IT)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~

1. a) Perform the subtraction with the following unsigned binary numbers by taking the 2's complement of the subtrahend:
   i) 100 – 110000 ii) 11010 - 1101.
   b) Construct a table for 4 -3 -2 -1 weighted code and write 9154 using this code
   c) Perform arithmetic operation indicated below. Follow signed bit notation:
   i) 001110 + 110010 ii) 101011 - 100110.
   d) Explain the importance of gray code. (4M+4M+4M+3M)

2. Draw logic diagrams to implement the following Boolean expressions
   a) Y = A + B + B'(A + C') b) Y = A(B EX-OR D) + C'
   c) Y = (A' + B') (C + D') d) Y = [(A + B') (C' + D)] (4M+4M+4M+3M)

3. Implement the following Boolean function F, using the two-level form logic
   a) NAND-AND, b) AND-NOR, c) OR-NAND
   $F(A,B,C,D)= \sum (0,4,8,9,10,11,12,14)$ (15M)

4. a) Implement Half adder using 5 NAND gates
   b) Implement full subtractor using NAND gates only. (5M+10M)

5. a) Implement a 64 :1 MUX using 16:1 and 4:1 Muxs.
   b) Realize a BCD to Excees-3 code converter using MUX. (7M+8M)

6. Tabulate the truth table for 8 x 4 ROM to input the following functions:
   i) $A= \Sigma (1,2,4,6)$ ii) $B=\Sigma(0,1,6,7)$ iii) $C= \Sigma (2,6)$ iv)$D=\Sigma(1,2,3,5,7)$ (15M)

7. a) Convert a T flip flop to D type flip flop
   b) Determine how the circuit shown in Fig. 7.12 functions as a T-type flip-flop. What problem would there be when T= 1 and how could it be resolved.

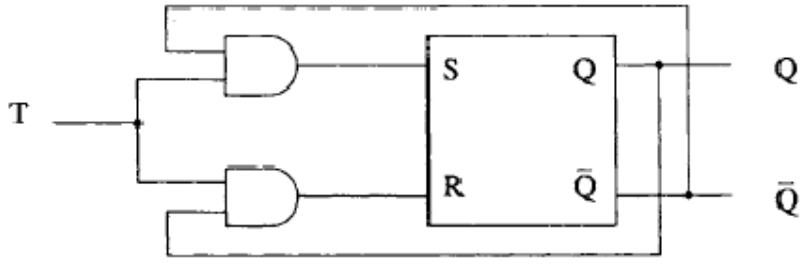


Fig. 7.12

(7M+8M)

8. Define BCD Counter and Draw its State table? (15M)

|''|'||||''|''||'|'|
~~~~~~~~~~~~~~~~~~~~~~~~

Code No: R21054 **R10** SET - 4

II B. Tech I Semester, Regular Examinations, Nov – 2012
DIGITAL LOGIC DESIGN
(Com. to CSE, IT)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~

1. a) What is ABE_H, in decimal?
   b) Perform 64_{10}- 83_{10} using ten's complement arithmetic.
   c) What is 100111110011_2 in hexadecimal?
   d) Subtract-5 from-8 using binary notation. (4M+4M+4M+3M)

2. a) Show that a positive logic NAND gate is a negative logic NOR gate and vice versa
   b) Convert each of the following expressions into sum of products and product of sum:
   i) (AB + C)(B + C'D) ii) x' + x(x + y')(y + z') (7M+8M)

3. Simplify the follow Boolean functions, using four variable maps:
   a) $F(w,x, y,z) = \sum(1,4,5,6,12,14,15)$
   b)$F(A,B,C, D) = \sum (1,5,9,10,11,14,15)$ (7M+8M)

4. a) Design a 4 bit carry look ahead adder circuit.
   b) Implement full subtractor using NAND gates only. (7M+8M)

5. a) Design a BCD to Gray code converter using 8:1 MUXS.
   b) Write a HDL program to model an 8 bit comparator using 2 bit comparators. (7M+8M)

6. a) How many 32kX8 RAM chips are needed to provide a memory capacity of 256k bytes?
   b) How many lines of address must be used to access 256kbytes? How many of these lines are connected to the address inputs of all chips?
   c) How many lines must be decoded for the chip select inputs ?specify the size of decoder. (15M)

7. a) How many flip-flops are required to construct mod-12 ring and Johnson counters?
   b) How could:
   i) a JK flip-flop be used as a D-type?
   ii) a JK flip-flop be used as a T-type?
   iii) a D-type flip-flop be used as a T-type? (6M+9M)

8. Design a left shift and right shift for the following data
   10110101 (15M)
~~~~~~~~~~~~~~~~~~~~~~~~

Code No: W0221 **R07** SET - 1

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
ELECTRICAL MACHINES-I
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) What are singly-excited and doubly-excited systems? Give an example for each.
   b) For a singly excited magnetic field system, derive expression for the magnetic stored energy.

2. a) Name the main parts of a d.c machine and briefly explain the functions each of them.
   b) An 8-pole, 20 kW, 220 V dc generator has a simple lap-wound armature, which has 64 coils with 16 turns per coil. Its rated speed is 1400 rpm. (i) How much flux per pole is required to produce the rated voltage in this generator at no-load condition? (ii) What is the current per path in the armature of this generator at the rated load? (iii) If the resistance of this winding is 0.01Ω per turn, what is the armature resistance of this machine?

3. a) Discuss the effect of using compensating winding in d.c. machines.
   b) A 4-pole lap-wound d.c generator has 492 conductors and 82 commutator segments. The armature current is 153 A. It is given a brush lead of 5 commutator segments from the GNA. Calculate (i) the cross and demagnetizing ampere-turns per pole and (ii) find the extra field turns required on the field magnet to compensate the demagnetization, if the field winding carries a current of 13 A.

4. a) Define the terms critical resistance and critical speed and bring out their roles in the process of self-excitation of d.c machines.
   b) A 4-pole short shunt wave-wound generator supplies 20 kW load at terminal voltage of 250 V, R_a=0.1Ω, R_{sh}=100 Ω, R_{se}=0.2 Ω and flux per pole = 0.05 Wb. Assume the total brush drop 2 V. Find (i) the e.m.f generated and (ii) number of conductors in each parallel path if the speed is 1200 rpm.
~~~~~~~~~~~~~~~~~~~~~~~~~

5. a) What is the necessity of equalizer bar while paralleling compound generators?

   b) The following readings were recorded in magnetization characteristics of a separately excited generator.

Field current(A)	0	0.25	0.5	0.75	1	1.25	1.5	1.75	2
E.M.F(V)	10	40	80	120	142	168	178	190	205

   When the machine is loaded, the readings are observed as i_a(full load)= 20 A, V = 160 V, i_f = 1.75 A, R_a = 0.5 . Find (i) no-load generated emf, (ii) drop due to armature reaction at full load and (iii) field current to overcome demagnetizing effect of armature reaction.

6. a) Explain principle of operation of a dc motor and derive the expression for torque produced.

   b) A shunt generator delivers 50 kW at 250 V when running at 400 rpm. The armature and field resistance are 0.02 Ω and 50 Ω respectively. Calculate the speed of the machine when running as a shunt motor and taking 50 kW input at 250 V. Assume 1 V per brush for contact drop.

7. a) Explain with a neat sketch, the working of a 3-point starter.

   b) A series motor, with an unsaturated magnetic circuit and 0.5 Ω total resistance, when running at a certain speed takes 60 A at 500 V. If the load torque varies as the cube of the speed, calculate the resistance required to reduce the speed by 25 %.

8. a) Explain Swinburne's test to determine no-load losses of a dc machine.

   b) The Hopkinson's test on two similar shunt machines gave the full-load data: Line voltage =110 V; Line current =48 A; Motor armature current =230 A; field currents: 3 A and 3.5 A. Armature resistance of each machine: 0.035 Ω. Calculate the efficiency of each machine assuming a brush contact drop of 1 V per brush.

Code No: W0221 **R07** SET - 2

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
ELECTRICAL MACHINES-I
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) Explain briefly an electromechanical energy conversion device with the help of a block diagram.
   b) Define field energy and co-energy. What is the significance of co-energy in electromechanical energy conversion?

2. a) Explain the working principle of a d.c generator.
   b) A six pole lap wound d.c. machine armature has 70 slots with 20 conductors/slot. The ratio of pole arc to pole pitch is 0.68. The diameter of bore of the pole shoe is 0.46 m. The length of pole shoe is 0.3 m. If the air gap flux density is 0.3 Wb/m^2 and the e.m.f. induced in the armature is 500 V, find the speed at which it runs.

3. a) Why are interpoles provided in a dc machine? Describe their role in improving the commutation in a d.c generator.
   b) The commutator ring of a d.c machine has a diameter of 40 cm. The thickness of mica insulation is 0.3 cm and brush thickness is 1.8 cm. Calculate the time of commutation for a coil to reverse the current of 20 A in each coil if the speed of the armature is 1500 r.p.m and the reactive voltage, if the self-inductance of the coil is 0.05 mH.

4. a) Explain different methods of excitation of d.c generators with suitable diagrams.
   b) The following data pertain to the magnetization curve of a 4-pole, separately excited generator at 600 r.p.m is as follows.

I_f in Amps	1.6	3.2	4.8	6.4	8.0	9.6	11.2
E_G in Volts	148	285	390	460	520	560	590

   Calculate (i) the voltage to which the machine will excite as a shunt generator with a field circuit resistance of 60 Ω, ii) critical field resistance and iii) critical speed at this field resistance of 60 Ω.
~~~~~~~~~~~~~~~~~~~~~~~~~

5. a) Explain carefully the exact procedure for connecting a shunt generator in parallel with others already supplying a load.
   b) The external characteristic of a series generator from zero to 40 V at 200 A is a straight line. The total resistance of the generator is 0.02 Ω. If it is used as a booster between a 110 V bus-bar and a feeder of 0.2 Ω resistance, determine:
   i) The voltage available to a consumer at the far end of the feeder at a load current of 100 A.
   ii) Find the power supplied by the booster.

6. a) Explain the function of commutator in a D.C. motor.
   b) A 6-pole, 230 V DC series motor has a flux per pole of 4mWb/A over the working range of the magnetization curve which is assumed to be linear. The load torque is proportional to speed squared and its value is 20 N-m at 800 rpm. There are 432 wave-connected conductors and the total resistance of motor is 1.0 Ω. Determine the motor speed and current when this motor is connected to rated supply voltage.

7. a) Explain with neat sketch how speed control of a DC shunt motor is done by Ward Leonard method.
   b) A dc series motor has the following rating: 200V, 20A and 1000 rpm. Armature and series field resistances are 0.1 Ω and 0.2 Ω respectively. Magnetic circuit can be assumed to be linear. At what speed the motor will run at rated torque if a resistance of 20 Ω is placed in parallel with the armature?

8. a) Explain how Hopkinson's test is carried out on two dc shunt machines to obtain efficiency.
   b) A retardation test is made on a separately excited dc machine as a motor. The induced emf falls from 240 V to 225 V in 25 seconds on opening the armature circuit and 6 seconds on suddenly changing the armature connection from supply to a load resistance taking 10 A (average). Find the efficiency of the machine when running as a motor and taking a current of 25 A on a supply of 250 V. The resistance of its armature is 0.4 Ω and that of its field winding is 250 Ω.

Code No: W0221 **R07** SET - 3

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
ELECTRICAL MACHINES-I
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) Draw and explain the general block-diagram representation of an electromechanical energy conversion device.
   b) Derive an expression of field energy in a singly-excited electromechanical unit.

2. a) Explain the following terms as applied to a d.c. armature winding.
      i) Front pitch ii) Back pitch
      iii) Commutator pitch iv) winding pitch
   b) A 4-pole, lap wound, d.c shunt generator has a useful flux/pole 0.06 Wb. The armature winding consists of 200 turns, each turn having a resistance of 0.003 Ω. Calculate the terminal voltage when running at 1000 r.p.m if armature current is 45 A.

3. a) Enumerate the methods used for improving commutation and explain any one of them in detail.
   b) A 50 kW, 500 V, 4-pole generator has a 2 layer simplex lap winding in 36 slots with 10 conductors in each layer. If the brushes are given an actual lead of 10^0, calculate:
      i) Demagnetizing AT/pole
      ii) Cross-magnetizing AT/pole,
      iii) Number of turns per pole on the compensating winding if the pole arc to pole pitch is 0.8 and brushes are placed on geometric neutral axis.

4. a) What is meant by the saturation curve? What test must be performed to determine data for its construction?
   b) The open circuit characteristics of a separately excited DC generator driven at 1000 rpm is as follows:

Field current (A)	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6
EMF (volts)	25	50	70	85	95	105	110	115

   If the machine is connected as shunt generator and driven at 1100 rpm and has a filed resistance of 100 ohms, find (i) open circuit voltage and exciting current (ii) The critical field resistance and (iii) resistance to induce 120 V on open circuit.
~~~~~~~~~~~~~~~~~~~~~~~~~

5. a) Explain, with appropriate diagrams, the procedure to obtain external characteristics of shunt and series generators.
   b) Two separately excited dc generators are running in parallel each supplying 500 A at 450 V. The armature resistance of each machine is 0.1 Ω. If the load current supplied by first generator is to be reduced to zero, determine:
      i) The percentage decrease in induced emf of first machine
      ii) Change in terminal voltage.
      iii) Total load current and emf of second machine remains unchanged.

6. a) Draw the characteristic curves of D.C. shunt motors. Use these curves to explain the applications of shunt motor.
   b) A 500 V, 37.3kW, 1000 rpm. DC shunt motor has on full load an efficiency of 90%. The armature circuit resistance is 0.24 Ω and there is total voltage drop of 2V at the brushes. The field current is 1.8A. Determine i) full-load line current ii) full load shaft torque in N-m and iii) Total resistance in motor starter to limit the starting current to 1.5 times the full-load current.

7. a) Make a list of different speed control methods for DC motor. Discuss merits and demerits of each method.
   b) A shunt motor takes 50 A on full load from 250 V mains. Its speed is to be raised by 40% by weakening of the field flux. If the torque at the increased speed is 20% more than that at the initial speed, find the percentage change in field flux. The armature resistance (including brushes) is 0.5 Ω.

8. a) Draw the power flow diagram for a dc compound motor and derive the condition for maximum efficiency.
   b) The Hopkinson's test on two identical shunt machines gave the following results: Input voltage = 500 V; Input current = 15 A: Output current of generator = 120 A; Field current of generator = 4 A; Field current of motor =3 A; Armature resistance of each machine = 0.06 Ω. Find the efficiency of motor and generator.

Code No: W0221 **R07** SET - 4

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
ELECTRICAL MACHINES-I
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) Explain briefly an electromechanical energy conversion process with the help of a block diagram.
   b) Define the field energy and co-energy. Give the significance of co-energy in the derivation of torque or force in an electromechanical energy conversion system

2. Draw the developed diagram for a 4-pole, 17 slot, and double-layer simplex wave winding with each slot having 2 coil sides. Assume progressive winding.

3. a) What are the detrimental effects of armature reaction?
   b) What is meant by commutation and linear commutation? What are the effects of commutation on generated voltage?

4. a) What are the reasons for failure of voltage buildup in a dc shunt generator?
   b) A 250 kW, 500 V long shunt compound generator has the following data: armature resistance including brush resistance is 0.03 Ω, series field resistance is 0.012 Ω, diverter resistance is 0.036 Ω, shunt field resistance is 100 Ω and commutating field winding resistance is 0.011 Ω. Calculate the voltage and power generated by the armature when the machine is delivering full load.

5. a) Explain how internal and external characteristics are obtained for a d.c compound generator.
   b) Two dc shunt generators with emfs of 120 V and 115 V, armature resistances of 0.05 Ω and 0.04 Ω and field resistances of 20 Ω and 25 Ω respectively are in parallel supplying a total load of 25 kW. How do they share the load?

6. a) Draw the characteristics of a dc series motor and from the nature of the curves explain the application of dc series motors.
   b) The input to a 220 V D.C. shunt motor is 11 kW. The other particulars of the motor are: No load current = 5 A; No load speed= 1150 rpm; Armature resistance= 0.5 Ω; shunt field resistance=110 Ω. Calculate : i) the torque developed ii) The efficiency iii) The speed at this load.
~~~~~~~~~~~~~~~~~~~~~~~~~

7. a) Draw a neat schematic of a four-point starter and explain its operation.
   b) A 230 V dc shunt motor takes an armature current of 20 A on a certain load. Resistance of armature is 0.5 Ω. Find the resistance required in series with the armature to halve the speed if i) the load torque is constant ii) the load torque is proportional to the square of the speed.

.

8. a) Determine a suitable method for determining the efficiency of a series motor
   b) A 500 V shunt motor takes 4 A on no-load. The armature resistance including that of brushes is 0.2 Ω and the field current is 1 A. Estimate the output and the efficiency when the input current is 20 A.

Code No: X0324 **R07** SET - 1

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
THERMODYAMICS
(Com. to ME, AE, AME)

Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~

1. a) What are different thermodynamic systems? Give example for each type with justification.
   b) A mass of 1 kg of air contained in a closed vessel at 1 bar, 300 K is stirred with a constant torque of 1 N-m at a speed of 1000 RPM till the volume doubles at constant pressure. The initial and final temperatures were found to be the same. If 10 kJ of heat is absorbed during the experiment, calculate its duration.

2. a) Define Internal Energy and show that internal energy is a property of the system.
   b) Air flows steadily at the rate of 0.4 kg/s through an air compressor, entering at 6 m/s with a pressure of 1 bar and a specific volume of 0.85 m^3/kg, and leaving at 4.5 m/s with a pressure of 6.9 bar and specific volume of 0.16 m^3/kg. The internal energy of air leaving is 88 kJ/kg greater than that of air entering. Cooling water in a jacket surrounding the cylinder absorbs heat from the air at the rate of 59 W. Calculate the power required to drive the compressor and cross sectional areas of inlet and outlet.

3. a) What is Clausius Inequality? Explain the Principle of Increase of Entropy for an adiabatic system.
   b) 1 kg of steam at 5 bar and 200^0C in a closed system is first mixed adiabatically with 1 kg of saturated water at 5 bar. The mixture is then cooled at constant volume by heat loss to atmosphere at 300 K till its final state is 1 bar, 0.55 dry. Calculate the irreversibility.

4. a) A large insulated vessel is divided into two chambers, one containing 5 kg of dry saturated steam at 0.2 MPa and the other 10 kg of steam, 0.8 quality at 0.5 MPa. If the partition between chambers is removed and the steam is mixed thoroughly and allowed to settle, find the final pressure, steam quality and the entropy change in the process.
   b) Using TdS equations and Maxwell's relations, obtain the expression for Clausius – Clapeyron Equation.
~~~~~~~~~~~~~~~~~~~~~~~~

5. a) Explain how the real gas behavior is captured using Vander Waal's Equation of State. What are modifications done to Ideal Gas Equation of State?

   b) 0.5 kg of Helium and 0.5 kg of Nitrogen are mixed at 20^0C and at a total pressure of 100 kPa. Find the

      i) Volume of the mixture,

      ii) The partial pressures of the constituent gases,

      iii) The mole fractions of the components,

      iv) The specific heats of the mixture and

      v) Gas constant of the mixture.

6. a) With the help of a schematic diagram, explain how the adiabatic saturation temperature is obtained.

   b) Air at 40^0C DBT and 27^0C WBT is to be cooled and dehumidified by passing it over a cooling coil to a give a final condition of 15^0C and 90% RH. Find the amount of heat moisture removed per kg of dry air.

7. a) For the air standard Brayton cycle, show that the thermal efficiency if a function of pressure ratio.

   b) In an air standard Otto cycle, the compression ratio is 7 and the compression begins at 35^0C, 0.1 MPa. The maximum temperature in the cycle is 1100^0C. Find i) Cycle efficiency and ii) Mean Effective Pressure of the cycle.

8. Write short notes on the following:

   a) Thermodynamic analysis of Throttling Process (Make necessary assumptions)

   b) Vapour Compression Refrigeration Cycle

   c) Absolute temperature scale

Code No: X0324 **R07** SET - 2

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
THERMODYAMICS
(Com. to ME, AE, AME)

Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~

1. a) Establish the First Law of Thermodynamics from the Joule's Experiment.
   b) Briefly explain the macroscopic and microscopic view points.
   c) The energy in Joule (J) of a closed system can be expressed as $E=100+50T+0.04\ T^2$. The heat absorbed is given by Q (in Joule) = 5000 + 20 T. Temperature is in K. Calculate the work done during a process when the temperature rises from 500 K to 1000 K.

2. a) State and prove Carnot's theorem.
   b) A house is to be maintained at a temperature of 20^0C by means of a heat pump pumping heat from the atmosphere. Heat losses through the walls of the house are estimated at 0.65 kW per unit of temperature difference between the inside of house and atmosphere.
   i) If the atmospheric temperature is -10^0C, what is the minimum power required to drive the pump? ii) It is proposed to use the same heat pump to cool the house in the summer. For the same room temperature, the same heat loss rate, and the same power input to the pump, what is the maximum permissible atmospheric temperature?

3. Calculate the changes of entropy per kg of air in the following cases:
   i) Air expands isothermally from 6 bar to 3 bar
   ii) Air is compressed to half the volume at constant pressure and
   iii) Heat is supplied to air at constant volume till the pressure becomes three fold
   What would be the change in entropy of the air undergoes the above three processes in sequence. Take C_p = 1.005 kJ/kgK and C_v = 0.720 kJ/kgK.

4. a) Using the Maxwell's relations, obtain the expression for the difference of specific heats at constant pressure and constant volume in terms of the derivatives of properties. Hence show that $C_p - C_v$ is always positive.
   b) With the help of a schematic diagram, explain the measure of steam quality using the separating and throttling calorimeter.
~~~~~~~~~~~~~~~~~~~~~~~~

5. a) Explain the law of corresponding states. Hence briefly explain the significance of compressibility chart.

   b) Two vessels A and B, each of volume 3 m^3 may be connected together by a tube of negligible volume. Vessel A contains air at 7 bar, 95^0C and vessel B contains air at 3.5 bar , 205^0C. Find the change of entropy when A is connected to B. Assume the mixing to be complete and adiabatic.

6. a) Define the following properties: i) Humidity Ratio ii) Dew Point temperature and iii) Relative humidity

   b) Cooling water enters the cooling tower at a rate of 1000 kg/h and 70^0C. Water is pumped from the base of the tower at 24^0C and some makeup water is added afterwards. Air enters the tower at 15^0C, 50% RH, 1.01325 bar and leaves the tower saturated at 34^0C, 1 bar. Calculate the flow rate of dry air in kg/h and the makeup water required per hour.

7. a) An engine working on Otto cycle has an air standard efficiency of 56% and rejects 544 kJ/kg of air. The pressure and temperature of air at the beginning of compression are 0.1 MPa and 60^0C respectively. Compute i) the compression ratio of the engine and b) maximum pressure in the cycle.

   b) Explain the simple Rankine cycle with the help of a schematic and T-S diagram.

8. Write short notes on the following

   a) Clausius Inequality

   b) Clausius – Clapeyron Equation

   c) Equivalence of Clausius and Kelvin-Plank statements of Second law of Thermodynamics

Code No: X0324 **R07** SET - 3

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
THERMODYAMICS
(Com. to ME, AE, AME)

Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) What is Thermal Equilibrium and hence define Zeroth Law of Thermodynamics.
   b) Define Point and Path functions. Give one example for each.
   c) 3 kg of air in a rigid vessel at 5 bar and 100^0C is stirred till the pressure reaches 15 bar. Meanwhile, the air absorbs 200 kJ of heat. Calculate the final temperature and stirrer work.

2. a) Show that the absolute temperature scale is independent of working fluid.
   b) Two streams of air, one at 1 bar, 27^0C and velocity of 30 m/s and the other at 5 bar, 227^0C and velocity of 50 m/s mix in equal proportion in a chamber from which heat at the rate of 100 kJ/kg is removed. The mixture is then passed through an adiabatic nozzle. Find the velocity of the stream issuing out of the nozzle. The temperature of the air leaving the nozzle is 27^0C and its C_p = 1.005 kJ/kgK

3. a) Show that the thermal efficiency of reversible engine operating between two heat reservoirs is greater than that of an irreversible engine.
   b) 1 kg of ice at -10^0C is exposed to the atmosphere which is at 25^0C. The ice melts and comes in contact with the atmosphere. i) Determine the entropy increase of the universe, ii) What is the minimum amount of work necessary to convert the water back into ice at -10^0C? C_p of ice is 2.093 kJ/kgK and the latent heat of fusion of ice is 333 kJ/kg.

4. a) Explain the measurement of steam quality using the separating and throttling calorimeter by means of schematic diagram.
   b) Obtain the expression for Joule-Kelvin coefficient for an ideal gas undergoing Joule – Thomson expansion.
~~~~~~~~~~~~~~~~~~~~~~~~~

5. a) Show that for an ideal gas, the slope of constant volume line on T-S diagram is more than that of constant pressure line.
   b) A closed rigid and insulated vessel is divided by a diaphragm into two equal compartments, each of volume 0.1 m^3. Each compartment contains air at a temperature of 20^0C. The pressure in one compartment is 2.5 MPa and in other compartment is 1 MPa. The diaphragm is ruptured so that the air in both the compartments mixes to reach a uniform pressure throughout the cylinder. Find the net change of entropy for the mixing process.

6. a) What is the significance of Psychrometric chart? Represent the following processes on the Psychrometric chart: i) Sensible heating, ii) Adiabatic dehumidification and iii) Latent heat removal.
   b) The moist air enters the heater-humidifier unit at 5^0, 100 kPa, 50% RH. The flow rate of dry air is 0.1 kg/s. Liquid water at 10^0C is sprayed into the mixture at the rate of 0.002 kg/s. The mixture leaves the unit at 30^0C, 10 kPa. Calculate the relative humidity at the outlet and the rate of heat transfer.

7. a) With the help of P-V and T-S diagrams, compare the Otto, Diesel and Dual cycles for the same maximum pressure and the temperature.
   b) In a gas turbine plant with air at the inlet of the compressor is at 0.1 MPa, 30^0C. The pressure ratio is 6 and the maximum temperature in the cycle is 900^0C. Find the cycle efficiency and net work. If the pressure ratio is increased to 10, for the same maximum temperature, calculate the cycle efficiency and the net work. Comment on the result.

8. Write short notes on the following:
   a) First law of Thermodynamics applied to a process in a closed system and to an open system
   b) Adiabatic saturation temperature

Code No: X0324 **R07** SET - 4

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
THERMODYAMICS
(Com. to ME, AE, AME)

Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) What are different modes of Work? Explain any two of them with the help of relevant State – Space diagram.
   b) Briefly explain the concept of Continuum.
   c) 5 kg of steam at 5 bar, 0.5 dry, contained in a closed rigid system is adiabatically stirred till the steam becomes dry and saturated. If the stirrer delivers a torque of 1 N-m and its speed is 1000 RPM, calculate the time for which the stirrer should be on.

2. a) Explain the First Law of Thermodynamics applied to a process in a closed system. Make necessary assumptions
   b) A heat engine drives a heat pump. The heat delivered by the heat engine as well as by the pump is used to heat the water circulating through the heat radiators of a building. The efficiency of the heat engine is 27% and the coefficient of performance of heat pump is 4. Calculate the ratio of heat transferred to the circulating water to the heat taken by the heat engine.

3. An aluminium block (C_p = 400 J/kgK) with a mass of 5 kg is initially at 40^0C in a room with air at 20^0C. It is cooled reversibly by transferring heat to a completely reversible cyclic heat engine until the block reaches 20^0C. The room serves as the constant temperature heat sink for the engine. Compute the change in entropy of the block, change in entropy of the room and work done by the engine.If the aluminium block is allowed to cool by natural convection to room air, compute the change in entropy of the block, change in entropy of the room and change in entropy of the universe.

4. a) Using the Maxwell's relations, Obtain the expression for the difference of specific heats at constant pressure and constant volume in terms of the derivatives of properties. Hence obtain its expression for an ideal gas.
   b) A rigid closed tank of volume 3 m^3 contains 5 kg of wet steam at a pressure of 200 kPa. The tank is heated until the steam becomes dry saturated. Determine the final pressure and heat transfer to the tank.
~~~~~~~~~~~~~~~~~~~~~~~~~

5. a) A gaseous mixture consists of 1 kg of oxygen and 2 kg of nitrogen at a pressure of 150 kPa and a temperature of 20^0C. Determine the changes in internal energy, enthalpy and entropy when the mixture is heated to a temperature of 100^0C, i) at constant volume and ii) at constant pressure.

   b) Relative merits of Ideal gas equation of state and the Vander Waal's equation of state.

6. a) Explain working of cooling tower and hence write the energy and mass balance equations for water and air undergoing heat and mass interactions.

   b) Two streams of air, one at 25^0C, 50% RH and other at 25^0C and 60% RH are mixed adiabatically to obtain 3 kg of dry air at 30^0C. Calculate the air drawn from both the streams and the humidity ratio of the mixed air.

7. a) Show that for an Otto cycle, the thermal efficiency is a function of compression ratio and show the variation of efficiency with compression ratio.

   b) In an air standard Diesel cycle, the compression ratio is 15. The compression begins at 0.1 MPa, 40^0C. The heat added is 1.675 MJ/kg. Find i) Maximum temperature in the cycle, ii) Cycle efficiency, iii) Cut-off ratio and d) MEP of the cycle

8. Write short notes on any two of the following:

   a) Thermodynamic Analysis of Rankine Cycle by using schematic and T-S diagram

   b) Carnot cycle and its efficiency when used as reversible engine

Code No: X0423 **R07** SET - 1

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
SIGNALS AND SYSTEMS
(Com. to ECE, EIE, BME)

Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~

1. a) A rectangular function is defined as

$$f(t) = \begin{cases} A \ \ for \ \ 0 \le t \le \dfrac{\pi}{2} \\ -A \ \ for \ \ \dfrac{\pi}{2} \le t \le 3\dfrac{\pi}{2} \\ A \ \ for \ \ 3\dfrac{\pi}{2} \le t \le 2\pi \end{cases}$$

Approximate above function by A cost between the intervals (0, 2π) such that mean square error is minimum.

b) Explain how a function can be approximated by a set of orthogonal functions.

2. a) Consider the periodic square wave x(t) as shown in Figure 1 given below. Determine the complex exponential Fourier series of x(t).

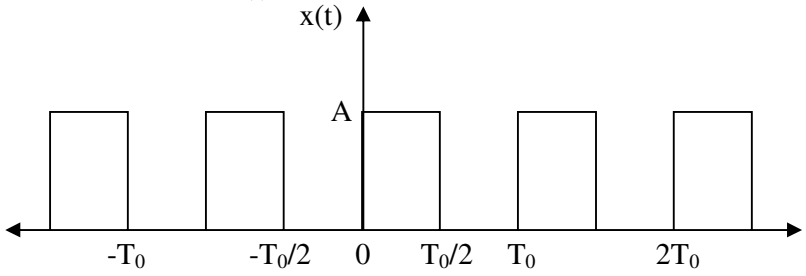


Figure 1

b) State and prove the following Fourier series properties.
i) Time differentiation ii) Frequency shift

3. a) Consider a continuous time LTI system described by $\frac{d\ y(t)}{dt} + 2y(t) = x(t)$. Using the Fourier transform, find the output y(t) to each of the following input signals:

i) $x(t) = e^{-t}u(t)$ ii) $x(t) = u(t)$

b) State and prove the following properties of Fourier transform:
i) Multiplication in time domain ii) Convolution in time domain
~~~~~~~~~~~~~~~~~~~~~~~~

4. a) The frequency response H(jω) of a causal LTI filter is shown in Figure 2 given below. Find the filtered output signal y(t) for the following input signals

i) $x(t) = \sin(\omega_0 t)u(t)$ ii) $x(j\omega) = \frac{1}{2 + j\omega}$

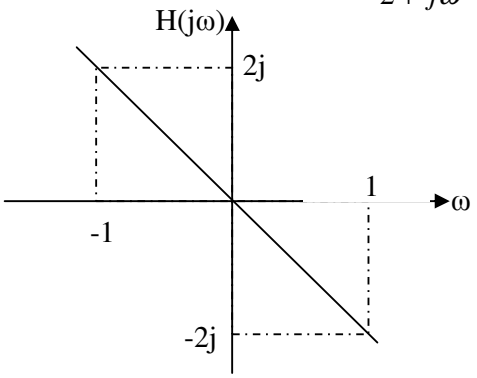


Figure-2

b) Given a continuous LTI system with unit impulse response h(t). A continuous time signal x(t) is applied to the input of this LTI system, where, $x(t) = e^{-at}u(t)$ for a>0 and $h(t) = u(t)$ and evaluate the output.

5. a) Compute the convolution sum y(n) to the following pair of sequences:

i) $x(n) = y(n), \text{h(n)} = 2^n u(-n)$ ii) $x(n) = \left(\frac{1}{2}\right)^n u(n), h(n) = \delta(n) - \frac{1}{2}\delta(n-1)$

b) State and prove convolution property of Fourier transforms.

6. a) Discuss sampling of continuous time signals.
b) Find the Nyquist rate and the Nyquist interval for the signal

$$x(t) = \frac{1}{2\pi}\cos(4000\pi t)\cos(1000\pi t)$$

7. a) A cosine wave cosωt is applied as the input to the series RL circuit shown in Figure 3 given below. Find the resultant current i (t) if the switch S is closed at t=0

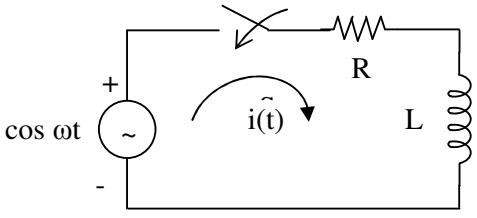


Figure-3

b) State and prove any four Laplace transform properties

8. a) The z-transform of a particular discrete time signal x(n) is expressed as

$X(z) = \frac{1 + 0.5Z^{-1}}{1 - 0.5Z^{-1}}$ Determine the x(n) using time shifting property.

b) State and prove any four z-transform properties.

Code No: X0423 **R07** SET - 2

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
SIGNALS AND SYSTEMS
(Com. to ECE, EIE, BME)

Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~

1. a) Check whether the following signals are orthogonal or not

   $X_1(n) = e^{jk(\pi/8)n}$ *and* $X_2(n) = e^{jm(2\pi+\pi/8)n}$

   b) Define mean square error and derive the expression for evaluating mean square error.

2. a) Consider the periodic impulse train $\delta_{T0}(t)$ which is defined $\delta_{T0}(t) = \sum_{K=-\infty}^{\infty} \delta(t - KT_0)$

   Determine the complex exponential Fourier series.

   b) Explain the trigonometric Fourier series with necessary mathematical expressions

3. a) Find the Fourier transform of the signal $X(t) = \dfrac{\sin at}{\pi t}$

   b) Briefly explain the following terms:

   i) Hilbert transforms ii) Modulation theorem

4. a) What is an LTI system? Explain its properties.

   b) Find the impulse response of the system shown in the Figure 1 given below. Find the transfer function. What would be its frequency response? Sketch the response.

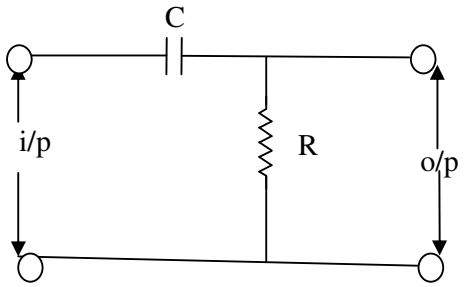


Figure 1
~~~~~~~~~~~~~~~~~~~~~~~~

5. a) *If* $y(t) = x(t) * h(t)$ then show that $x(t-t_1) * h(t-t_2) = y(t-t_1-t_2)$

   b) Derive an expression that relates energy spectral density and autocorrelation function.

6. a) A continuous time signal is given below: x(t) = 8 cos 200πt

   i) Minimum sampling rate

   ii) If f_s=400Hz, what is the continuous signal obtained after sampling

   iii) What is the frequency $0 < f < f_s / 2$ of sinusoidal that yields samples identical to those obtained in part (ii)

   b) State and explain Sampling theorem for continuous signals.

7. a) Discuss various properties of ROC's for Laplace transform.

   b) Determine the inverse Laplace transform of the following:

   i) $\dfrac{s^3 + 1}{s\,(s+1)\,(s+2)}$ ii) $\dfrac{s-1}{(s+1)\,(s^2+2s+5)}$

8. a) Using long division, determine the inverse Z-transform of

$$X(z) = \frac{1}{1 - \left(\frac{3}{2}\right) z^{-1} + \left(\frac{1}{2}\right) z^{-2}}$$

   b) State and prove the following properties

   i) Convolution property ii) Correlation property

   iii) Time shifting property iv) Time reversal property

Code No: X0423 **R07** SET - 3

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
SIGNALS AND SYSTEMS
(Com. to ECE, EIE, BME)

Time: 3 hours Max. Marks: 80

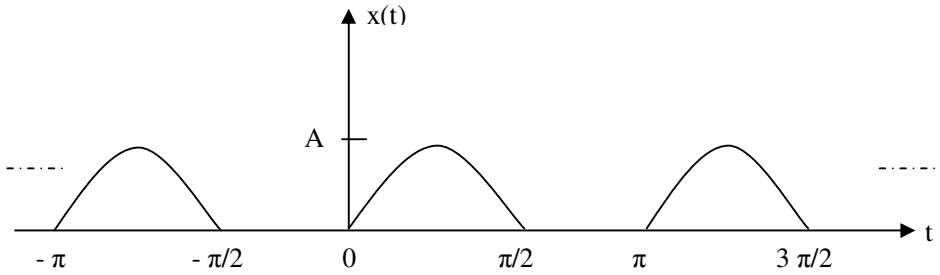
Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~

1. a) Prove the following signals are periodic and their fundamental period is $2\pi/\omega_0$

   i) $x(t) = e^{j\omega_0 t}$ ii) $x(t) = \cos(\omega_0 t + \theta)$

   b) Explain the concepts of impulse function, unit step function and signum function.

2. a) Find the Fourier series expansion of the half wave rectified sine wave shown below.



   b) Discuss the Drichlet conditions.

3. a) Show that $x(t)\cos\omega_0 t \leftrightarrow \frac{1}{2}X(\omega-\omega_0)+\frac{1}{2}X(\omega+\omega_0)$ and

$$X(t)\sin\omega_0 t \leftrightarrow -j\left[\frac{1}{2}X(\omega-\omega_0)-\frac{1}{2}X(\omega+\omega_0)\right]$$

   b) Find the fourier transform of the following signal.

$$Sgn(t) = \begin{cases} 1 & for\ t > 0 \\ -1 & for\ t < 0 \end{cases}$$
~~~~~~~~~~~~~~~~~~~~~~~~

4. a) What is Paley-Winer criterion? Explain its significance
   b) Determine the maximum bandwidth of signals that can be transmitted through low pass RC filter as shown in the Figure 1 given below, if over this bandwidth the gain variation is to be within 10% and the phase variation is to be within 7% of the ideal characteristics.

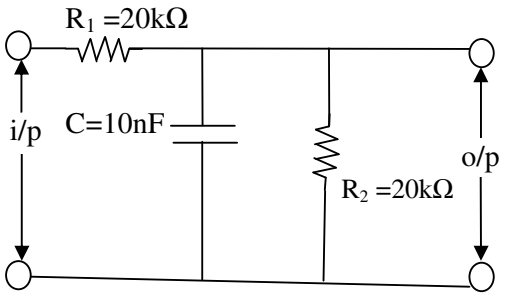


Figure 1

5. a) Discuss cross correlation and its properties.
   b) Find the power, rms value and sketch the PSD for the following signal.
   x(t) = (A+sin 100t) cos 200t

6. a) Determine the Nyquist rate for a continuous time signal
   x(t) = 6 cos50πt+20 sin 300πt+10 cos 100πt
   b) Explain the following terms:
   i) Natural sampling ii) Importance of sampling theorem

7. a) State and prove initial and final value theorem wrt Laplace transform
   b) Determine the Laplace transform of the following:
   i) x(t) = sin (at) cos (bt) ii) x(t) = Cos^3 3t iii) x(t) = t sin at

8. a) Determine the inverse Z-transform of the following X(Z) by the partial fraction expansion method. $X(Z) = \dfrac{Z+2}{2Z^2 - 7Z + 2}$

   If the ROC's are

   i) $|Z| > 3$ ii) $|Z| < 1/2$ iii) $\dfrac{1}{2} < |Z| < 3$

   b) Explain the differentiation property of Z-transform.

Code No: X0423 **R07** SET - 4

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
SIGNALS AND SYSTEMS
(Com. to ECE, EIE, BME)

Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~

1. a) Discuss how an unknown function f(t) can be expressed using infinite mutually orthogonal function. Show the representation of a waveform f(t) using trigonometric Fourier series.
   b) Determine whether the following signals are energy signals, power signals or neither.
   i) $x(t) = A\cos(\omega_0 t + \theta)$ ii) $x(t) = e^{-at}u(t), a > 0$ iii) $x(t) = t\,u(t)$

2. a) Determine the complex exponential Fourier series representation for each of the following signals:
   i) $x(t) = \cos(2t + \pi/4)$ ii) $x(t) = \cos 4t + \sin 6t$ iii) $x(t) = \sin^2 t$
   b) Write short notes on "Complex Fourier Spectrum".

3. a) Prove the frequency convolution theorem that is $x_1(t)x_2(t) \leftrightarrow \frac{1}{2\pi} X_1(\omega) * X_2(\omega)$
   b) Find the inverse Fourier transform of the following:
   i) $X(\omega) = \frac{1}{(a + j\omega)^2}$ ii) $X(\omega) = \frac{1}{a - j\omega}$

4. a) Obtain the conditions for the distortion less transmission through a system. What do you understand by the term signal bandwidth & system bandwidth?
   b) Check whether the following systems are linear time invariant systems or not.
   i) y(t) = sin x(t) ii) y(t) = t x(t) iii) y(t) = x(t) cos 200 π iv) $y(t) = t\,e^{-2t}$
~~~~~~~~~~~~~~~~~~~~~~~~

5. a) Discuss the relation between convolution & correlation and briefly explain autocorrelation and its properties.

   b) For the signal $x(t) = e^{-at} u(t)$, find out the total energy contained in the frequency band $|f| \le W \ where \ W = a/2\pi$

6. a) Discuss different sampling techniques.

   b) Explain the effect of under sampling-aliasing.

7. a) Define Laplace transform. Distinguish between Laplace transform and continuous time Fourier transforms.

   b) Find the output response y(t) of the RC low pass network as shown in the Figure 1 given below due to the input $x(t) = t\, e^{-t/RC}$ by convolution.

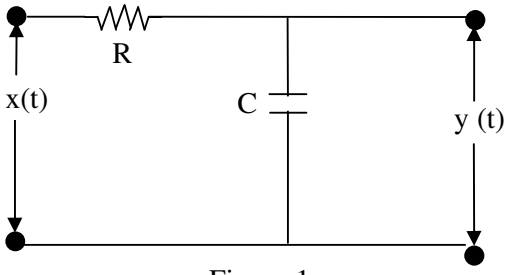


Figure 1

8. a) Determine the final value of the signal corresponding to the Z-transform

$$X(Z) = \frac{2Z^{-1}}{1 - 1.8Z^{-1} + 0.8Z^{-2}}$$

   b) Explain different properties of ROC of Z-transform.

Code No: X0523 **R07** SET - 1

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
ADVANCED DATA STRUCTURES
(Com. to CSE, ECC)

Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~

1. a) How does a main() function in C++ differ from main() in C? Describe the major parts of a C++ program.
   b) What is a friend function? Give its merits and demerits.

2. a) What is an operator function? Describe the syntax and usage of an operator function with examples.
   b) Write a program that illustrates of applications of base and derived classes.

3. a) What is an abstract data type? Are basic data types are abstract data types?
   b) Explain various components of space complexity?

4. a) What is a hash function? Briefly describe any two methods of collision resolution
   b) What is linear probing? Briefly describe quadratic probing

5. a) Write a C++ function to build a heap? How many number of comparisons required for it?
   b) Show the result of inserting 10, 12, 1, 14, 6, 5, 8, 15, 3 and 9, one at a time into an initially empty heap?

6. Define a Binary Search Tree? Write the procedures to perform insertion, deletion and searching in a binary search tree?

7. a) With an example, find the number of disk accesses needed to delete an element that is in a non leaf mode of a B-Tree of order m?
   b) With an example, Briefly describe the process of insertion into B-tree

8. Write an algorithm for Brute Force pattern matching and analyze its time complexity with suitable example.
~~~~~~~~~~~~~~~~~~~~~~~~

Code No: X0523 **R07** SET - 2

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
ADVANCED DATA STRUCTURES
(Com. to CSE, ECC)

Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~

1. a) What do you mean by dynamic initialization of a variable? Give an example.
   b) With an example, briefly describe dynamic memory allocation and deallocation

2. a) A friend function can not be used to overload the assignment operator =. Explain why?
   b) Write a main program that calls a deeply nested function containing an exception. Incorporate necessary exception handling mechanism.

3. a) What is template? Explain about function templates and class templates with suitable examples.
   b) Define Algorithm? What are the characteristics of algorithms?

4. a) Write a method in C++ to erase a pair in the dictionary with key theKey in a skip list representation. What is the complexity of this method?
   b) What are the data members of skipList class? Write the constructor for skipList.

5. a) Write a C++ function to insert an element into min heap.
   b) With an example, briefly describe multiway merge

6. What is an AVL Tree? Explain about the different insertion, deletion and searching operations in AVL trees.

7. a) What is the maximum number of disk accesses needed to delete an element that is in a non leaf node of a B-tree of order m.
   b) Briefly describe Red-black and splay trees.

8. a) What are the advantages and disadvantages of tries with respect to binary search tree.
   b) Explain the complexity of Brute Force pattern matching algorithm.
~~~~~~~~~~~~~~~~~~~~~~~~

Code No: X0523 **R07** SET - 3

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
ADVANCED DATA STRUCTURES
(Com. to CSE, ECC)

Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~

1. a) Can a copy constructor accept an object of the same class as parameter, instead of reference of the object?
   b) When will you make a function inline? Why?
   c) What are the advantage of using new operator as compared to the function malloc()?

2. a) What are the different forms of inheritance? Give an example of each.
   b) Briefly describe function over loading with an example

3. a) Write a C++ program to build a stack with its basic operations.
   b) With an example, briefly describe Queue ADT.

4. a) What is the structure to represent node in a skip list. Write the constructor for skipList.
   b) What are the major advantages of extendible hashing over other hashing techniques?

5. a) What are priority queues? Explain its advantages and disadvantages over queues.
   b) Write the C++ program that gives the method search of a hash table.

6. Define a class called binarySearchTree to represent a Binary search tree. Extend this class by adding a public method outputInRange (Low,High) that outputs, in ascending order of key, all elements in a binary search tree whose key lies between Low and High. Use recursion and avoid entering sub trees that cannot possibly contain any elements with keys in desired range.

7. a) Write a program for inserting an element in B-trees.
   b) Briefly compare search trees

8. a) Explain the compressed trie with an example.
   b) Write an algorithm for Brute Force pattern matching and analyze its time complexity with suitable example.
~~~~~~~~~~~~~~~~~~~~~~~~

Code No: X0523 **R07** SET - 4

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
ADVANCED DATA STRUCTURES
(Com. to CSE, ECC)

Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~

1. a) What is a class? With an example, briefly describe access control.
   b) How function overloading can be achieved? On what basis, the compiler distinguishes between a set of overloaded functions having the same name?

2. a) Describe the syntaxes of single and multiple inheritances. When do we use multiple inheritance?
   b) When do we make a virtual function "pure"? What are the implications of making a function a pure virtual function?

3. a) With an example, briefly describe list ADT.
   b) Briefly discuss the components of space complexity

4. a) Explain about the skip list representation of dictionary with an example?
   b) Define Dictionary and Dictionary with duplicates? List the operations performed on a dictionary?

5. a) What is Linear Probing? Write a C++ program that gives the data members and constructors for the hash table class that uses linear probing.
   b) Write a C++ function to remove max element form a heap.

6. a) Explain how to represent binary search tree with duplicates?
   b) Explain the insertion operation of binary search tree with duplicates?

7. a) Draw the order-7 B-tree resulting from inserting the following keys into an initially empty tree T: 4,40,23,50,11,34,62,78,66,22,90,59,25,72,64,77,39,12
   b) Describe the B-trees? Explain the advantages of B-trees.

8. How will the KMP algorithms behave if the pattern and/or the text are null (have length zero)? Will they"crash"? if not, will their output be meaningful and correct.
~~~~~~~~~~~~~~~~~~~~~~~~

Code No: X1221 **R07** SET - 1

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
ADVANCED DATA STRUCTURES AND ALGORITHMS
(Information Technology)

Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) Illustrate about class, objects and class members with an example.
   b) What is Constructor? With an example C++ Program, describe the importance of Constructor.

2. a) Describe function overloading and write a C++ program to implement function overloading
   b) Describe about runtime polymorphism using mutual function

3. a) What is the space complexity of a recursive function *int fact(int a)*?
   b) What is ADT? Briefly describe sparse matrix representation

4. a) What is hashing? Briefly describe about hashing with chains.
   b) Compare and contrast linear probing Vs quadratic probing techniques.

5. a) What are different ways of representing priority queue(s) and briefly describe them.
   b) Describe about heap sort techniques and give its applications

6. a) Briefly describe Red-Black Trees and their imbalances.
   b) Define AVL tree and discuss about finding height of an AVL tree.

7. a) Briefly describe divide and conquer technique.
   With an example, briefly describe algorithm for binary search
   b) Elucidate about control abstraction algorithm for divide and conquer method

8. a) What is Greedy method? With an algorithm, briefly describe 0/1 Knapsack problem.
   b) Formulate equations for 0/1 Knap-sack problem using dynamic programming.
~~~~~~~~~~~~~~~~~~~~~~~~~

Code No: X1221 **R07** SET - 2

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
ADVANCED DATA STRUCTURES AND ALGORITHMS
(Information Technology)

Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) What is inline function? Write a C++ Program to implement inline functions.
   b) Define class and object explain about class scope in delay in detail.

2. a) Briefly describe operator overloading. Write a C++ program to implement operator overloading
   b) Define inheritance explain different types of inheritance with examples.

3. a) Write a C++ program to add two sparse matrices.
   b) Briefly describe queue ADT? And describe about its operations

4. a) Briefly describe how to perform insertion operation using double hashing for the list: 12, 54, 62, 45, 37, 78, 89, 29, 64, 48
   b) Briefly describe quadratic probing.

5. What is the significance of external sorting? With an example, briefly describe how to perform external sorting on multiway merge.

6. a) What are splay trees? Briefly describe splay tree operations with suitable examples.
   b) Give comparison of search Trees

7. a) Briefly describe strassen's matrix multiplication
   b) Briefly describe Quick sort algorithm with an example

8. a) With an algorithm, describe job sequencing with deadlines.
   b) Describe about ordering matrix multiplication.
~~~~~~~~~~~~~~~~~~~~~~~~~

Code No: X1221 **R07** SET - 3

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
ADVANCED DATA STRUCTURES AND ALGORITHMS
(Information Technology)

Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) What is Class Template? Briefly describe inheritance.
   b) Write a C++ program to implement class template.

2. a) What are class members and access control?
   b) Describe in detail about generic programming

3. a) Write an algorithm to insert an element into a queue using linked list.
   b) Explain different notations used to represent time complexity and space complexity.

4. a) What is skip list? With an example, briefly describe insertion, deletion and searching operations on skip list(s).
   b) Describe different collision resolution techniques.

5. What is an external sorting? With an example, briefly describe how to perform external sorting on polyphase merge.

6. What are AVL Trees? Briefly describe algorithms for four types of imbalances in AVL trees

7. a) Briefly describe disjoint set operations. Describe algorithms for union and find operation in sets
   b) Explain about strassens matrix multiplications

8. a) What are minimum cost spanning trees? Briefly describe prim's algorithm
   b) Briefly describe krushkal's algorithm.
~~~~~~~~~~~~~~~~~~~~~~~~~

Code No: X1221 **R07** SET - 4

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
ADVANCED DATA STRUCTURES AND ALGORITHMS
(Information Technology)

Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
~~~~~~~~~~~~~~~~~~~~~~~~~

1. a) What is *this* pointer? Briefly describe static members.
   b) With an example program, briefly describe constructor and parameter passing mechanism.

2. a) Briefly describe abstract classes with an example.
   b) Write a C++ program to demonstrate runtime polymorphism using virtual function

3. a) What is an algorithm? Briefly describe the properties of an algorithm. Briefly describe time complexity and space complexity
   b) Implement stack ADT using template classes in C++

4. a) Write a C++ program to implement dictionary with hashing.
   b) Briefly describe skip list along with their operations

5. a) What is Priority queue? Briefly describe the implementation of priority queues using heaps.
   b) Describe about heap sort and trace with an example.

6. What is an AVL Tree? Write a C++ program to implement binary search trees

7. a) Briefly describe bi-connected components
   b) Write an algorithm for strassen's matrix multiplication. Calculate time complexity compare this with conventional matrix multiplication.

8. a) What are OBST? With an algorithm, briefly describe OBST.
   b) Explain about general method for greedy method.
~~~~~~~~~~~~~~~~~~~~~~~~~