Code No: R31015 **R10** **Set No: 1**

III B.Tech. I Semester Regular Examinations, November/December - 2012
STRUCTURAL ANALYSIS-II
(Civil Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks
*****

1. A three hinged parabolic arch has span 25 m and a central rise of 5 m. The arch is hinged at the crown and springing. It carries a point load of 150 kN at 8 m from the left support. Calculate the horizontal thrust, the reactions at the support and the maximum bending moment.

2. A two hinged circular arch of span 25 m and central rise 5 m. The arch is hinged at the ends. It carries uniformly distributed load of 25 kN/horizontal metre run over the 10 m from the right support toward the centre. Calculate the horizontal thrust, the reactions at the supports and the maximum bending moment. Assume that the moment of inertia at any section is $I_0 \sec\theta$ where θ is the inclination of the arch with horizontal and I_0 is the moment of inertia of the section at the crown.

3. Analyse the frame shown in Fig.1, using Portal Method,

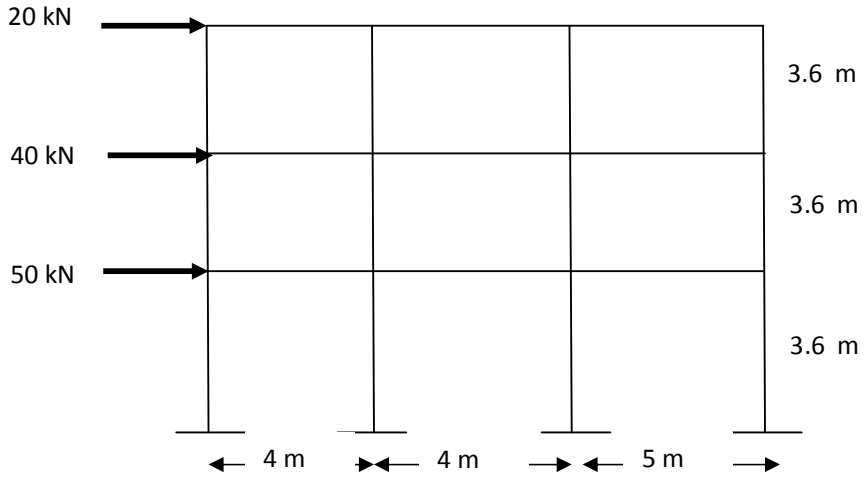

Fig.1

4. Determine the span of a steel parabolic cable suspended between two supports at the same level. The limiting value of the central dip is $1/12^{th}$ of the span and the permissible stress in the cable is 125 N/mm^2.

5. Analyse the beam shown in the Fig.2 , if the support **B** sinks by 10 mm. Use moment distribution method. Adopt I = 125 × 10^6 mm^4 and E = 2 × 10^5 N/mm^2.

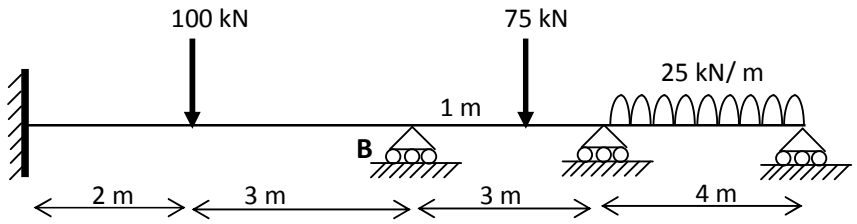

Fig.2

6. Analyse the beam shown in Fig.3, using Kani's method.

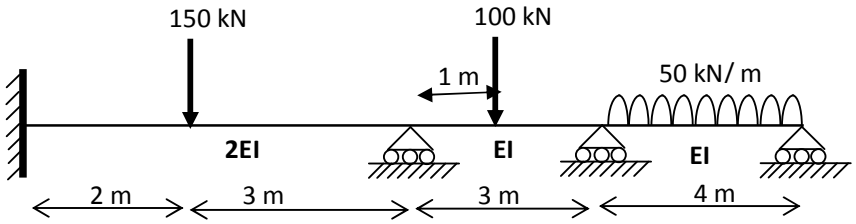

Fig.3

7. Analyse the beam shown in the Fig.4, using flexibility method.

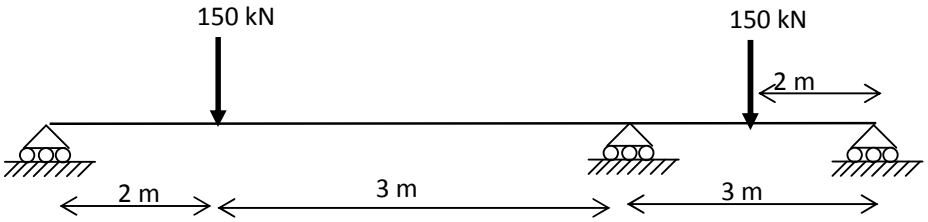

Fig.4

8. Analyse the beam shown in the Fig.5, using stiffness method.

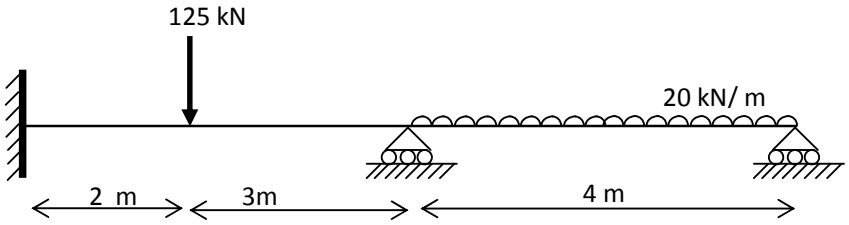

Fig.5

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Code No: R31015 **R10** **Set No: 2**

III B.Tech. I Semester Regular Examinations, November/December - 2012
STRUCTURAL ANALYSIS-II
(Civil Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks
*****

1. A three hinged circular arch has span 25 m and a central rise of 5 m. The arch is hinged at the crown and springings. It carries a point load of 150 kN at 8 m from the left support. Calculate the horizontal thrust, the reactions at the support and the maximum bending moment.

2. A two hinged parabolic arch of span 24 m and central rise of 5 m. The arch is hinged at the ends. It carries uniformly distributed load of 20 kN/horizontal metre run over the 8 m from the right support toward the centre. Calculate the horizontal thrust, the reactions at the supports and the maximum bending moment. Assume that the moment of inertia at any section is $I_0 \sec\theta$ where θ is the inclination of the arch with horizontal and I_0 is the moment of inertia of the section at the crown.

3. Analyse the frame shown in Fig.1, using Cantilever Method. Given within the paranthesis are the areas of the columns in that position.

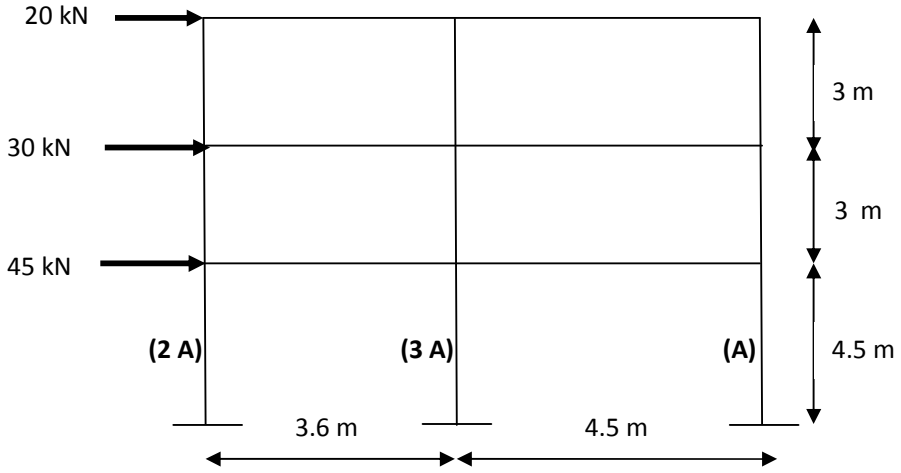

Fig.1

4. The horizontal span of a cable is 100 m. The left support is at higher level than the right support by 10 m. The dip of the lowest point of the cable is 4 m below the right support and the cable is subjected to a load of 6 kN/ horizontal metre. Find the maximum pull in the cable and also find the length of the cable.

5. Analyse the frame shown in the Fig.2, by moment distribution method.

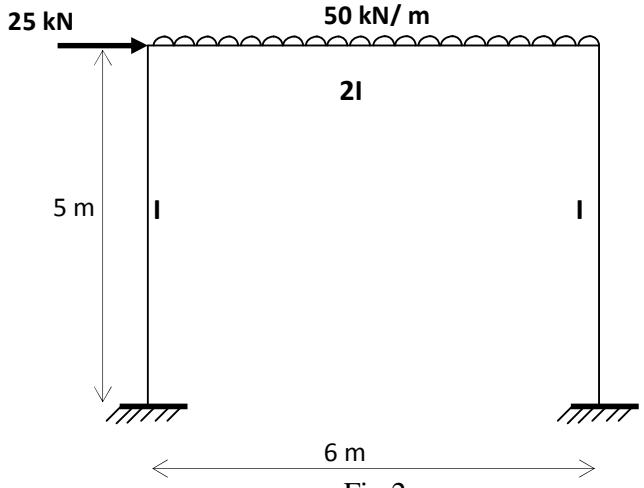

Fig.2

6. Analyse the beam shown in Fig.3, using Kani's method.

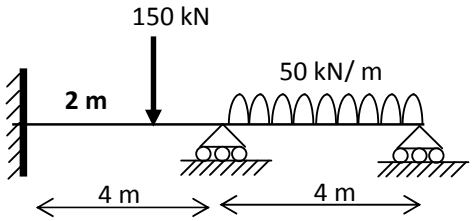

Fig.3

7. Analyse the beam shown in the Fig.4, using flexibility method.

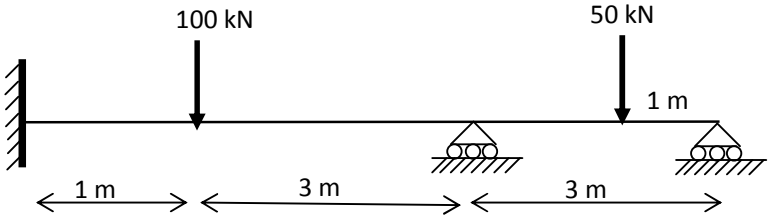

Fig.4

8. Using stiffness method, analyse the beam shown in Fig.5

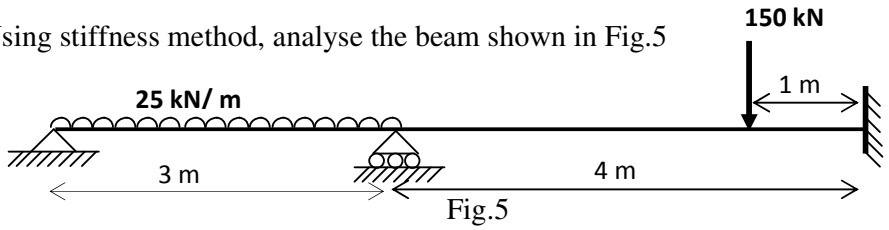

Fig.5

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Code No: R31015 **R10** **Set No: 3**

III B.Tech. I Semester Regular Examinations, November/December - 2012
STRUCTURAL ANALYSIS-II
(Civil Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks
*****

1. A three hinged parabolic arch of span 30 m and rise 6m carries uniformly distributed load of 50 kN/horizontal metre run over the right half of the span. Calculate the support reactions and also find bending moment, radial shear and normal thrust at a section 10 m from the right support.

2. A two hinged parabolic arch hinged at the supports has 50 m span and rise 10 m is subjected to 25 kN at 20 m from the right hinge. Find the reactions at the supports. Assume that the moment of inertia at any section is $I_0 \sec\theta$ where θ is the inclination of the arch axis with horizontal and I_0 is the moment of inertia of the section at the crown.

3. Analyse the frame shown in Fig.1,using portal frame method. Lateral loads are 40 kN, 60 kN and 80 kN acting from top. Each bay is 3.6 m and height of each storey is 4 m.

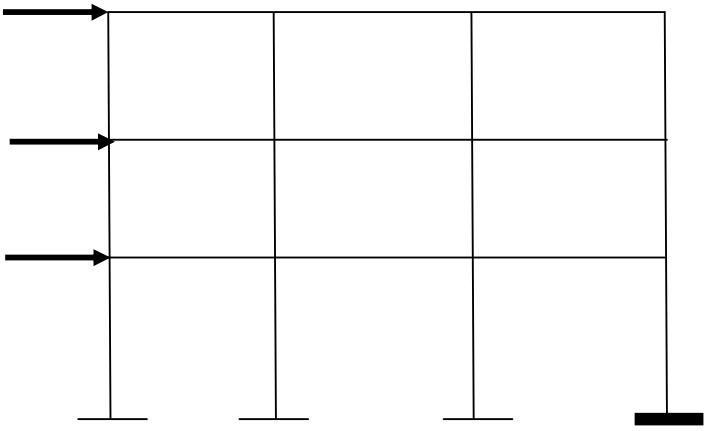

Fig.1

4. A suspension cable of 60 m span and 5 m dip is stiffened by a three hinged stiffening girder. It is subjected to a concentrated load of 150 KN at 10 m from the left end in addition to a dead load of 10 kN/m. Find the maximum tension in the cable and the shear force and the bending moment in the girder at 15 m from the left end.

5. Analse the beam shown in the Fig.2, by moment distribution method. Draw the shear force and bending moment diagrams.

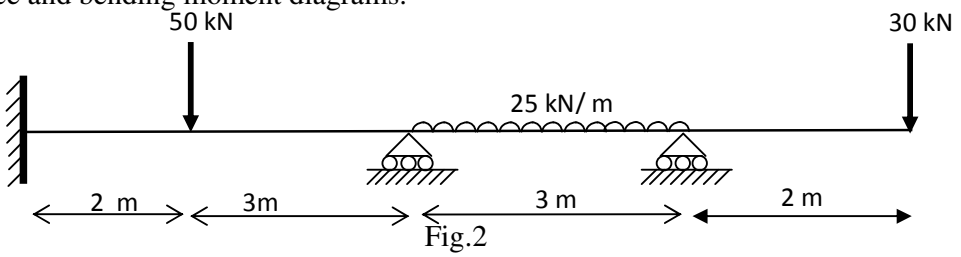

Fig.2

6. Analyse the frame shown in the Fig.3, by Kani's method.

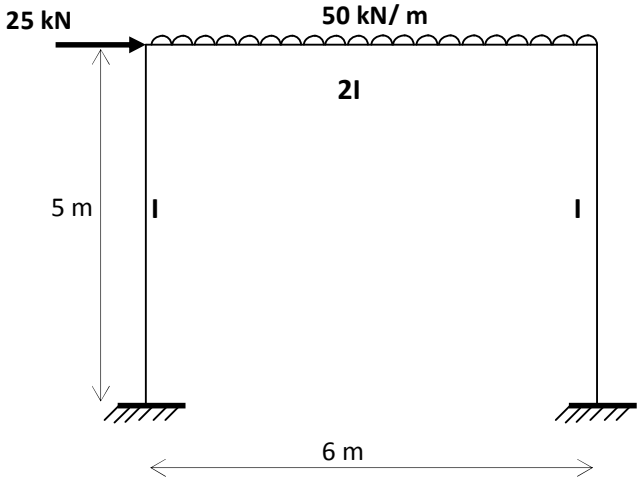

Fig.3

7. Analyse the beam shown in the Fig.4, using flexibility method.

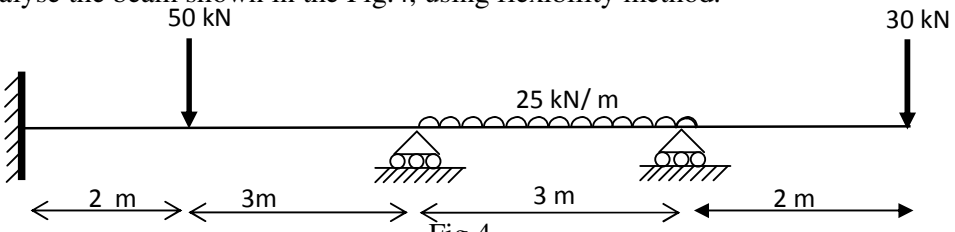

Fig.4

8. Analyse the continuous beam shown in Fig.5, using stiffness method.

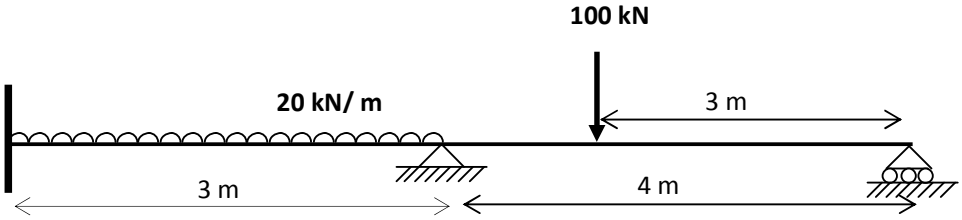

Fig.5

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Code No: R31015 **R10** **Set No: 4**

III B.Tech. I Semester Regular Examinations, November/December - 2012
STRUCTURAL ANALYSIS-II
(Civil Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks
*****

1. A three hinged circular arch of span 20 m and rise 5 m carries uniformly distributed load of 25 kN/horizontal metre run over the left half of the span. Calculate the support reactions and also find bending moment, radial shear and normal thrust at a section 10 m from the right support.

2. A two hinged parabolic arch of span 25 m and rise 6 m carries uniformly distributed load of 25 kN/horizontal metre run over the left half of the span. Calculate the support reactions and also find bending moment at a section 10 m from the left support. Assume that the moment of inertia at any section is $I_0 \sec\theta$ where θ is the inclination of the arch axis with horizontal and I_0 is the moment of inertia of the section at the crown.

3. Analyse the frame shown in Fig.1, using Portal Method.

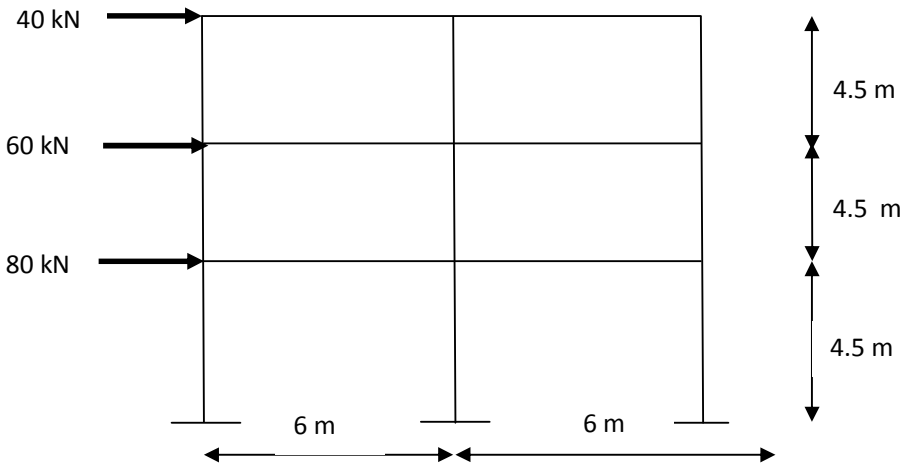

Fig.1

4. A suspension bridge has125 m span and supported by two cables with central dip of 10 m dip. The bridge carries total uniformly distributed load of 750 kN. The cables are attached to the saddles resting on rollers on the top of the piers and the anchor cables make an angle of 45^0 with vertical. Determine the tension in the anchor cables and the vertical pressure on the piers.

5. Analyse the beam shown in the Fig.2, by moment distribution method. Draw the shear force and bending moment diagrams.

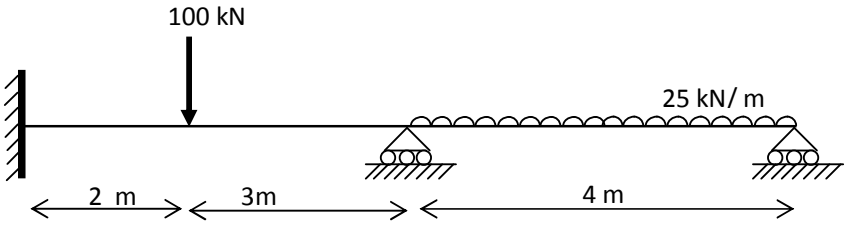

Fig.2

6. Analyse the frame shown in the Fig.3, by Kani's method.

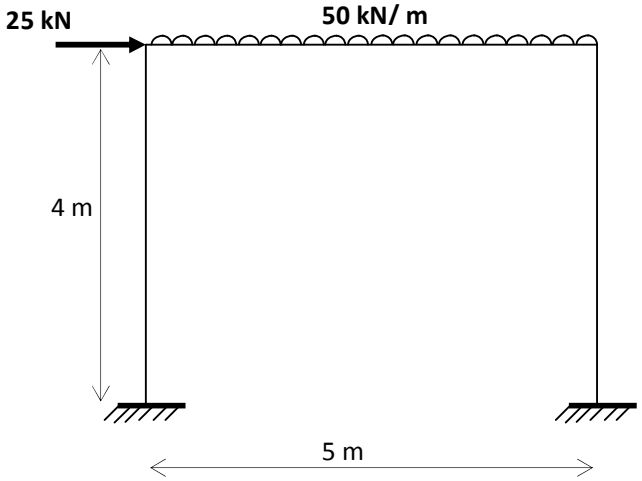

Fig.3

7. Analyse the continuous beam shown in Fig.4, using flexibility method.

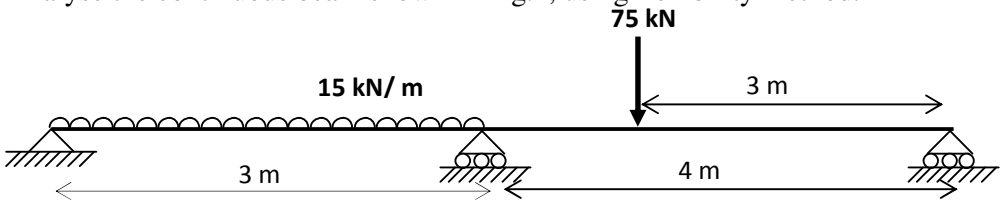

Fig.4

8. Analyse the continuous beam shown in Fig.5, using stiffness method.

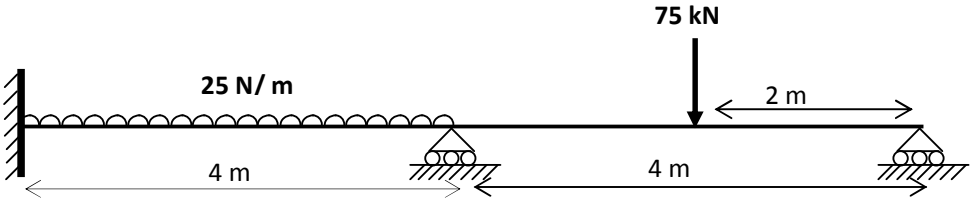

Fig.5

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Code No: R31025 **R10** **Set No: 1**

III B.Tech. I Semester Regular Examinations, November/December - 2012

ELECTRICAL MACHINES -III

(Electrical and Electronics Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

*****

1. Explain the constructional features and principle operation of a single phase induction motor. [15]

2. (a) Explain the working principle of an alternator with the help of a neat diagram.
   (b) A 3-phase, 16-pole synchronous generator has a resultant air-gap flux of 0.06 Wb per pole. The flux is distributed sinusoidally over the pole. The stator has 2 slots per pole per phase and 4 conductors per slot are accommodated in layers. The coil span is 150^0 electrical. Calculate the phase and line induced voltages when the machine runs at 375 rpm. [7+8]

3. (a) Explain the leakage reactance and armature reactance of an alternator.
   (b) The phase EMF of a 3-phase alternator consists of fundamental, 20% of 3rd harmonic and 10% of fifth harmonic. The amplitude of fundamental is 1000 V. Calculate the RMS value of line and phase voltage, when the alternator is connected in (i) Star (ii) Delta [7+8]

4. (a) Explain the two reaction theory as applied to salient pole synchronous machine?
   (b) A 1 MVA, 11kV, 3-phase, star connected synchronous machine has the following OCC test data

Filed current I_f (A)	40	110	140	180
E_{OL} (kV)	7	12.5	13.75	15

   where E_{OL} is line to line voltage at no load. The short circuit test yielded full load current at a field current of 65A, the armature resistance is negligible calculate the voltage regulation at full load 0.8 power factor lagging by MMF method. [8+7]

5. (a) What is meant by synchronization? Explain the way of synchroning an alternator to the infinite bus bars.
   (b) Two identical 3 MVA alternators are running in parallel. The frequency drops from no load to full load for the two alternators are 50Hz to 47 Hz and 50Hz to 48Hz respectively. (i) How will they share a load of 4000 kW (ii) what is maximum load they can share at unity power factor without overloading any alternator? [7+8]

6. (a) Explain the 'V-curves' and 'inverted V-curves' of synchronous motor.
   (b) Explain the various power stages of synchronous motor. What are the various losses taking place in synchronous motor. . [8+7]

7. (a) Show that the locus of power of a synchronous machine is circle? Give the co-ordinates of the power circle.
   (b) Explain the hunting of a synchronous machine. What is the purpose of damper windings in a synchronous machine? [8+7]

8. (a) Compare AC series motor and Universal motor and mention their operational difficulties.
   (b) Explain the working principle of permanent magnet motors. [8+7]

*****

Code No: R31025 **R10** **Set No: 2**

III B.Tech. I Semester Regular Examinations, November/December - 2012

ELECTRICAL MACHINES -III

(Electrical and Electronics Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

*****

1. Show that a single phase winding when excited by a single phase supply produce two equal and opposite revolving fields. [15]

2. (a) Explain about integral slot and fractional slot windings.
   (b) A 4 pole alternator has an armature with 25 slots and 8 conductors per slot. The flux per pole is 0.06 Wb and machine rotates at 1500 rpm. Calculate the EMF generated, if the winding factor is 0.96 and all the conductor in a phase are connected in series. [7+8]
3. (a) Explain the load characteristics of an alternator.
   (b) Find the r.m.s value of fundamental and third harmonic EMF per phase for an alternator having the following data: 50Hz, 3-phase, 20 poles, 4 slot/pole/phase, double layer winding with 6 conductors/slot, coil span of 150^0 electrical, the fundamental flux per pole is 0.1 Wb and third harmonic is 17% of fundamental. All coils of a phase are connected in series. [7+8]

4. (a) Explain the Potier triangle method of finding the voltage regulation of an alternator.
   (b) A 3-phase, 200 kVA, 1.1 kV, 50 Hz star connected alternator having an effective per phase resistance of 0.62 ohms gave the following results:

Filed current (A)	20	35	50	80	100	120
Open circuit Voltage (V)	692.82	1120	1450	1750	1953	2180
Short circuit current (A)	0	20	40	60	80	100

   Using MMF method, find the voltage regulation at 100 A (i) 0.8 power factor lagging (ii) 0.8 power factor leading. [7+8]

5. (a) Discuss the phenomenon of sudden 3-phase short-circuit at armature terminals of an alternator. Draw the typical wave shape of the current and mark the different regions.
   (b) A 2 MVA, 3-phase, star connected, 4 pole, 750 rpm alternator is operating on 6000 V bus bars. The synchronous reactance is 6 ohms per phase. Find synchronizing power and torque for full load 0.8 power factor lagging. [8+7]

6. (a) Explain the construction and operating principle of synchronous motor.
   (b) Describe briefly the effect of varying excitation upon armature current and power factor of synchronous motor when the input power to motor is maintained constant [7+8].

7. (a) Why synchronous motor is not self starting? Explain the various starting methods of synchronous motor.
   (b) Explain the characteristics of synchronous induction motor. [8+7]

8. (a) Compare reluctance stepper motor and permanent magnet motor.
   (b) Explain the operation of a AC series motor with a neat diagram. [8+7]

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Code No: R31025 **R10** **Set No: 3**

III B.Tech. I Semester Regular Examinations, November/December - 2012

ELECTRICAL MACHINES -III

(Electrical and Electronics Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

*****

1. (a) Why single phase, single winding induction motors are not self starting? How they can be started.
   (b) Derive equation for forward slip and backward slip of a single phase induction motor. [7+8]

2. (a) Derive the expression for EMF induced per phase in a 3-phase alternator? Mention how different winding factors affect the induced e.m.f.
   (b) A 4-Pole, 3-Phase, 50 Hz, star-connected alternator with 12 slots and 24 conductors per slot. The flux per pole is 0.3 Wb and is sinusoidally distributed. Calculate the line e.m.f generated at 50Hz. [8+7]

3. (a) Explain the effect of armature reaction on the EMF induced in the alternator. Is it possible to obtain load voltage more than EMF inducted? If yes, how?
   (b) A 16 pole, 3-phase star connected alternator has 144 slots. The coils are short pitched by one slot. The flux per pole is $\Phi = 100 \sin\theta + 30 \sin 3\theta + 20 \sin 5\theta$. Find the harmonics as percentage of phase voltage and line voltage. [8+7]

4. (a) Explain the synchronous impedance method for finding the voltage regulation of an alternator. Mention its limitations.
   (b) A 3-phase, star connected salient pole synchronous generator is driven at a speed near synchronous with the field circuit open and the stator is supplied from a balanced 3-phase supply. Voltmeter connected across the line gave minimum and maximum readings of 1190 V and 1220 Volts. The line current fluctuated between 125 and 240 Amp. Find the direct and quadrature axis reactances per phase. Neglect armature resistances. [9+6]

5. (a) What are the effects of change of excitation and mechanical power input on alternators operated in parallel.
   (b) The EMFs of two alternators are $3200\angle 20^0$ and $3000\angle 0^0$ V. Their synchronous impedances are $2.2 + j19\,\Omega$ per phase and $2.5 + j32\,\Omega$ per phase. The load impedance is $9 + j5\,\Omega$ per phase. Find the circulating current. [7+8]

6. (a) Derive the expression for the maximum power developed by a synchronous motor.
   (b) A 3-phase star connected 440 V; the synchronous motor takes a power input of 5 kW at rated voltage. Its synchronous reactance is 5 ohms per phase and resistance is negligible. If its excitation voltage is adjusted equal to rated voltage of 400V, compute the load angle, power factor and armature current. [8+7]

7. (a) What is hunting. Discuss the problems with hunting.
   (b) What is meant by excitation circle? Explain the construction of excitation circle for a synchronous motor. [7+8]

8. Explain with neat diagrams the principle of operation of
   (a) AC series motor (b) Reluctance motor. [8+7]

*****

Code No: R31025 **R10** **Set No: 4**

III B.Tech. I Semester Regular Examinations, November/December - 2012

ELECTRICAL MACHINES -III

(Electrical and Electronics Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

*****

1. (a) Explain the operation of split phase single phase Induction motor with vector diagram.
   (b) Explain the working principle of a shaded pole motor. [8+7]

2. (a) Explain the various winding factors in an alternator? Explain the effects of these factors on induced e.m.f.
   (b) A 3-phase, star connected, 8 pole, 750 rpm alternator has 72 slots on its periphery. Each slot has 12conductors and the winding is short pitched by 2 slots. Find the pitch factor and distribution factor. Also, calculate the induced e.m.f between lines if the flux of 0.04wb is distributed sinusoidally. All the conductors in phase are connected in series. [7+8]

3. (a) What are harmonics? Explain the sources of harmonics. What are the various effects of harmonics on generated e.m.f in an alternator?
   (b) Draw the phasor diagrams of alternator, assuming the stator phase currents are to lagging, leading, deduce the expression for the induced voltage? [7+8]

4. (a) Explain how X_d and X_q of a salient pole alternator can be found experimentally.
   (b) A 1000 kVA, 11 kV, 3-phase star connected alternator has a resistance of 2 ohms per phase. The open circuit voltage and the voltage at rated full load current at zero power factor lagging are as follows:

Filed current I_f (A)	45	55	110	150	170
Line Voltage (V)	5900	7100	12600	13850	16000
Line Voltage (V) at ZPF	0	1500	8500	10550	12500

   Calculate the voltage regulation of the alternator by synchronous impedance method for full load current at 0.8 pf lagging [7+8]

5. (a) Show that in order to obtain a constant voltage, constant frequency of a practical bus bar system, the number of alternators connected in parallel should be as large as possible.
   (b) A 5 MVA, 10 kV, 1500 rpm, 3-phase, and 50 Hz alternator is operating on infinite bus bar. Find synchronizing power per mechanical degree of angular displacement at (i) No-load (ii) Full-load at rated voltage and 0.8pf lagging. [8+7]

6. (a) With the help of a vector diagram explain the operation of synchronous motor as synchronous condenser.
   (b) A sub-station operating at full load of 1200 kVA supplies a load at 0.7 power factor lagging. Calculate the permissible additional load at this power factor and the rating of synchronous condenser to raise the substation power to 0.9 lagging. [8+7]

7. (a) With neat diagram and explanation, show how damper winding prevents oscillations.
   (b) Explain the various starting methods of synchronous motor. [7+8]

8. (a) Explain simply why a universal motor can operate from DC supply as well as AC supply.
   (b) Explain the principle of operation of a permanent magnet motor with neat diagram. [7+8]

*****

Code No: R31035 **R10** **Set No: 1**

III B.Tech. I Semester Regular Examinations, November/December - 2012

DESIGN OF MACHINE MEMBERS - I

(Mechanical Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions

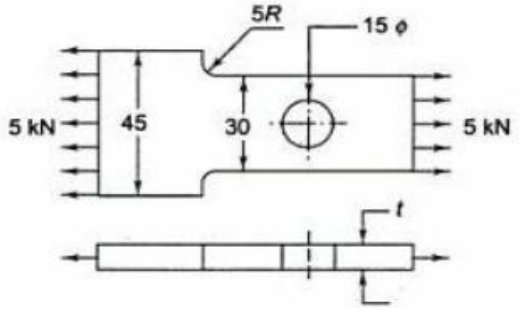
All Questions carry equal marks

*****

1. (a) Compare the Distortion energy theory and maximum shear stress theory.
   (b) A 50 mm diameter non rotating shaft of steel with yield strength of 400 MPa is subjected to a steady torque of 1500 Nm. Find the permissible steady bending moment that can be superimposed on it if the factor of safety is 5. Use Von-Mises theory. Locate the loading point in the Von-Mises ellipse.

2. (a) What is stress concentration? What are the different methods to reduce stress concentration?
   (b) A flat plate is subjected to a tensile force of 5 kN as shown in figure 1. The plate material is grey cast iron FG 200 and the factor of safety is 2.5. Determine the thickness of the plate. All the dimensions are in mm onlv.

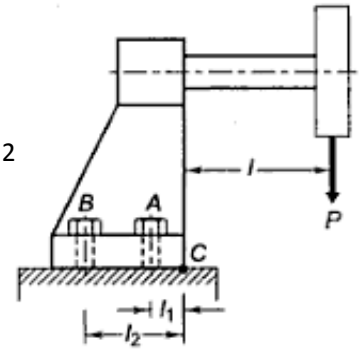
Figure 1



3. (a) Define the efficiency of the riveted joint. According to Indian Boiler Regulations, what is the highest efficiency required of a riveted joint?
   (b) A double riveted lap joint with chain riveting is to be made for joining two plates 10 mm thick. The allowable stresses are 60 MPa in tension, 50 MPa in shear and 80 MPa in crushing. Find the rivet diameter, pitch of rivets and distance between rows of rivets. Also find the efficiency of the joint.

4. A cast iron bracket, supporting the transmission shaft and the belt pulley, is fixed to the steel structure by means of four bolts as shown in Figure 2. There are two bolts at A and two bolts at B. The tensions in slack and tight sides of the belt are 5 kN and 10 kN respectively. The belt tensions act in a vertically downward direction. The distances are l_1 = 50 mm, l_2 = 150 mm and l = 200 mm. The maximum permissible tensile stress in the bolt is 60 N/mm^2. Specify a suitable bolt size.

Figure 2



5. (a) Where do you use cotter joint? Give practical examples.
   (b) Design and draw a cotter joint to support a load varying from 30 kN in compression to 30 kN in tension. The material used is carbon steel for which the following allowable stresses may be used. The load is applied statically. Tensile stress = compressive stress = 50 MPa; shear stress = 35 MPa and crushing stress = 90 MPa.

6. A shaft is supported by two bearings 400 mm apart and carries a bevel gear of 200 mm pitch diameter at one end that is overhanging beyond the nearer bearing by 150 mm. The gear produces a radial load of 9.8 kN and a thrust load of 2.94 kN when the speed is 600 rpm. Determine the shaft diameter if the shaft is made of steel with allowable shear stress of 40 MPa. Also determine the angle of twist and deflection at the bevel gear location if the modulus of rigidity is 80 GPa and the modulus of elasticity is 210 GPa.

7. (a) What is the difference between rigid and flexible coupling?
   (b) Design a cast iron flange coupling for joining two mild steel shafts transmitting 100 kW at 250 rpm. The angle of twist should not exceed 1^0 in a length of 25 diameters. Take yield strength in shear for the shaft is 40 MPa and for bolts is 28MPa.

8. (a) What is surge in spring? What are the methods to avoid the surge in spring?
   (b) Design a closed coil helical spring for a boiler safety valve which is required to blow off steam at pressure of 1.5 MPa. The diameter of the valve is 50 mm. The initial compression of the spring is 40 mm and the lift is limited to 20 mm.

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Code No: R31035 **R10** **Set No: 2**

III B.Tech. I Semester Regular Examinations, November/December - 2012

DESIGN OF MACHINE MEMBERS - I

(Mechanical Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

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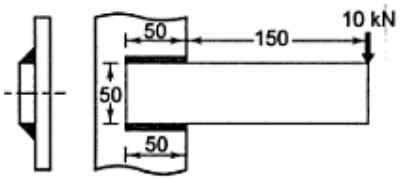
1. (a) Derive the relationship between the yield strength in shear and the yield strength in tension using the Distortion energy theory.
   (b) A machine element is subjected to principal stresses of 120 MPa, 0 MPa and -90 MPa. The material used is 30C8. Calculate the factor of safety by (a) the maximum normal stress theory, (b) the maximum shear stress theory and (c) the Distortion energy theory

2. (a) What is fatigue stress concentration factor? In what way, it is different from the theoretical stress concentration factor.
   (b) A machine part is made of forged steel with ultimate strength of 630 MPa and endurance strength is 0.22 times ultimate strength. The life of the part is 250000 cycles. The loading for the 50% of the time is ± 225 MPa and for 30% of the time is ± 145 MPa. Calculate the loading during the remaining time.

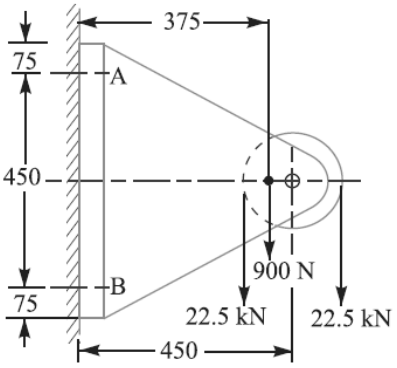
3. (a) What are primary and secondary shear stresses in eccentrically loaded welded joints? What are the assumptions made in evaluating them?
   (b) A welded connection of steel plates, as shown in Figure 1, is subjected to an eccentric force of 10 kN. Determine the throat dimension of the welds, if the permissible shear stress is limited to 95 MPa

Figure 1



4. A pulley bracket, as shown in Figure 2, is supported by 4 bolts, two at *A-A* and two at *B-B*. Determine the size of bolts using an allowable shear stress of 25 MPa for the material of the bolts. List the assumptions made in the analysis.

Figure 2



5. (a) What is knuckle joint? Give practical examples.
   (b) Design a knuckle joint to connect two circular rods subjected to an axial tensile force of 50 kN. The material for the two rods and pin is selected as plain carbon steel of Grade 30C8 with yield strength 400 MPa. Assume factor of safety of 5. Specify the dimensions of the knuckle joint with a neat sketch.

6. (a) Which theory is commonly used for the design of the shafts? Explain why?
   (b) An electric motor drives a machine through a pair of spur gears. The pinion is mounted on motor shaft and over hangs by 200 mm from the nearest bearing. The pinion has 20 teeth of 10 mm module and 200 involute profile. Design the motor shaft to transmit 15 kW at 1200 rpm. Use safe shear stress value of 40 MPa. Take the shock and fatigue correction factors as 1.2 and 1 respectively.

7. (a) What is the difference between protected and unprotected rigid flange coupling?
   (b) A driving shaft is joined with coaxial driven shaft through a muff coupling. The shaft transmits 60 kW of power at 150 rpm. Design the shaft, key and muff. Assume a factor of safety of 5 with following ultimate strength values.
   Ultimate shear strength for shaft = 300 N/mm^2
   Ultimate shear strength for key = 200 N/mm^2
   Ultimate shear strength for muff = 50 N/mm^2
   Ultimate compressive strength for key = 500 N/mm^2

8. (a) What are the different types of stresses induced in the wire of helical springs? Sketch its distribution.
   (b) From a toy gun, a bullet of 1 N is fired. The bullet travels a distance of 10 m. the compression of the spring when the gun is loaded is 100 mm and the bore of the barrel is 20 mm. Design a suitable spring.

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Code No: R31035 **R10** **Set No: 3**

III B.Tech. I Semester Regular Examinations, November/December - 2012

DESIGN OF MACHINE MEMBERS - I

(Mechanical Engineering)

Time: 3 Hours **Max Marks: 75**

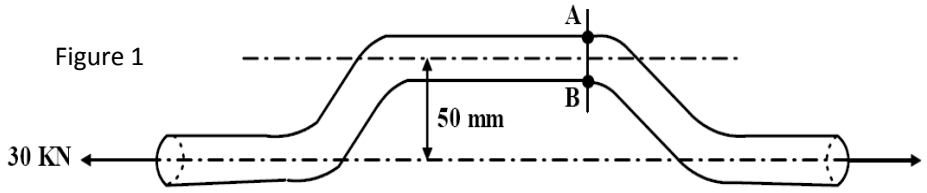
Answer any FIVE Questions

All Questions carry equal marks

*****

1. (a) Derive the Von Mises effective stress equation using the principal stresses.
   (b) A 100 mm diameter off-set link is transmitting an axial pull of 30 KN as shown in the figure 1. Find the stresses at points A and B.

Figure 1



2. (a) Compare the Soderberg, Goodman and Gerber diagrams for the zero variable stresses.
   (b) A machine component is subjected to fluctuating stress that varies from 40 to 100 N/mm^2. The corrected endurance limit stress for machine component is 270 N/mm^2. The ultimate and tensile strength of the material are 600 and 450 N/mm^2 respectively. Find the factor of safety using (i) Soderberg line, (ii) Goodman line and (iii) Gerber theory. Also, find the factor of safety against static loading.

3. (a) How is a rivet joint of uniform strength designed?
   (b)Two lengths of mild steel tie rod having width 200 mm are to be connected by means of Lozenge joint with two cover plates to withstand a tensile load of 180 kN. Completely design the joint, if the permissible stresses are 80 MPa in tension; 65 MPa in shear and 160 MPa in crushing. Draw a neat sketch of the joint.

4. A bearing shown in Figure 2 is fastened to a frame by 6 bolts spaced equally on a 250 mm bolt circle, of which 2 bolts are positioned on the horizontal line. The bearing flange diameter is 300 mm and a load of 50 kN is applied at 275 mm from the frame. Determine the size of the bolts. What are conditions required for the arrangement of the bolts to have the maximum strength. Assume that the bolt is made of C20 steel having yield strength of 245 MPa and Factor of safety 3.

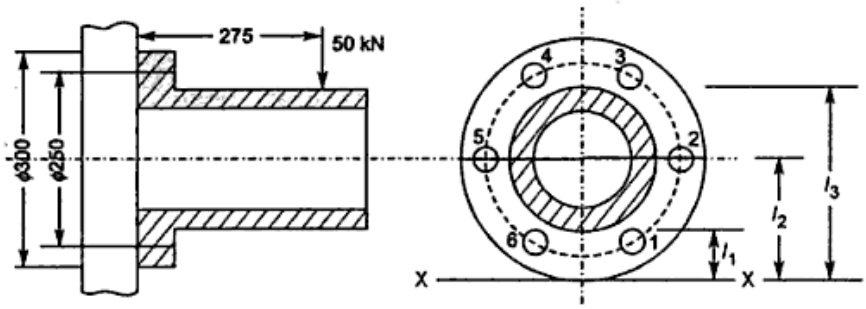


Figure 2

5. (a) Differentiate between a cotter and knuckle joint.
   (b) Design a spigot and socket joint to connect two rods of 30C8 steel to carry an axial tensile and compressive load of 10 kN. Explain the construction of the joint with a neat sketch

6. A steel shaft 800 mm long transmitting 15 kW at 400 r.p.m. is supported at two bearings at the two ends. A gear wheel having 80 teeth and 500 mm pitch circle diameter is mounted at 200 mm from the left hand side bearing and receives power from a pinion meshing with it. The axis of pinion and gear lie in the horizontal plane. A pulley of 300 mm diameter is mounted at 200 mm from right hand side bearing and is used for transmitting power by a belt. The belt drive is inclined at 30° to the vertical in the forward direction. The belt lap angle is 180 degrees. The coefficient of friction between belt and pulley is 0.3. Design and sketch the arrangement of the shaft assuming the values of safe stresses as: τ = 55 MPa; σ_t= 80 MPa. Take torsion and bending factor 1.5 and 2 respectively .

7. (a) Sketch a muff coupling and identify its advantages and disadvantages.
   (b) A shaft transmitting 150 kW is to be connected to a coaxial shaft through cast iron flange coupling. The shaft runs at 120 rpm. The key and shaft are to be made of same material for which permissible shearing stress is 60 N/mm^2 and compressive strength is 120 N/mm^2. The steel bolts may be subjected to maximum shearing stress of 26 N/mm^2. Design protected type flange coupling.

8. (a) Derive the expression for the strain energy stored in helical spring in terms of wire diameter, mean coil diameter and number of turns.
   (b) A railway wagon of mass 250 kN moving with a velocity of 2.5 m/s is brought to rest by springs of mean each diameter 350 mm. the maximum deflection of the spring is 210 mm. Find the wire diameter and number of turns. Take modulus of rigidity is 80 GPa and allowable shear stress 600 MPa.

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Code No: R31035 **R10** **Set No: 4**

III B.Tech. I Semester Regular Examinations, November/December - 2012

DESIGN OF MACHINE MEMBERS - I

(Mechanical Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

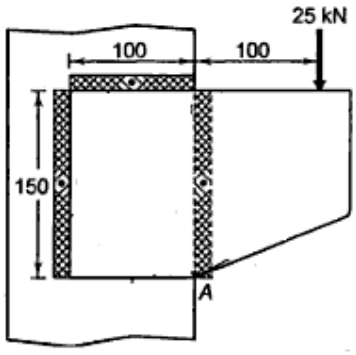
*****

1. (a) Differentiate between (i) Elastic Deformation and Plastic Deformation (ii) Ductility and Brittleness.
   (b)A mass of 50 kg drops through 25 mm at the center of a 250 mm long simply supported beam. The beam has square cross section. It is made of steel 30C8 and the factor of safety is 2. The modulus of elasticity is 207 000 N/mm^2. Determine the dimensions of the cross-section of the beam.

2. A cast iron shaft, with an ultimate tensile strength of 175 MPa, is subjected to a torsional load which is completely reversed. The load is to be applied an indefinite number of cycles. The shaft is 50 mm diameter and is joined to a 75 mm diameter shaft with 12.5 mm radius fillet. The factor of safety is to be 2. What is the maximum torque that can be applied to the shaft? Solve by two methods: (i) using Soderberg Equation (ii) Torsion Equation.

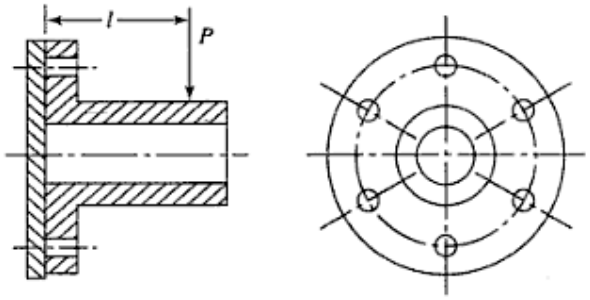
3. An eccentrically loaded bracket is welded to the support as shown in Figure 1. The permissible shear stress for the weld material is 55 N/mm^2 and the load is static. Determine the throat and leg dimensions for the welds. Explain the nature of the stresses induced in the welds.

Figure 1



4. For the circular flange shown in Figure 2, P = 20 kN and l = 100 mm. It is supported by 6 bolts of 30C8 steel at 150 mm pitch circle diameter. Find the diameter of the bolts if the outer diameter of the bracket is 200 mm. Consider Factor of safety = 6. List the assumptions made. Discuss the nature of the force developed in bolts.

Figure 2



5. (a) A heat treated steel shaft of tensile yield strength of 350 MPa has a diameter of 50 mm. The shaft rotates at 1000 rpm and transmits 100 kW through a gear. Select an appropriate rectangular key for the gear.
   (b) Draw a neat sketch of a cotter joint and write the equations of failure for the different sections.

6. A transmission shaft supporting a spur gear B and pulley D is shown in figure 3. The shaft is mounted on two bearings A and C. the diameter of the pulley and the pitch circle diameter of the gear are 450 and 300 mm respectively. The pulley transmits 20 kW power at 500 rpm to the gear. The belt tension ratio is 3. The material of the shaft is steel with ultimate strength 700 MPa and yield strength 460 MPa. Take the shock and fatigue correction factors are 1.5 each. The gear and pulley are keyed to the shaft. Determine the diameter of the shaft.

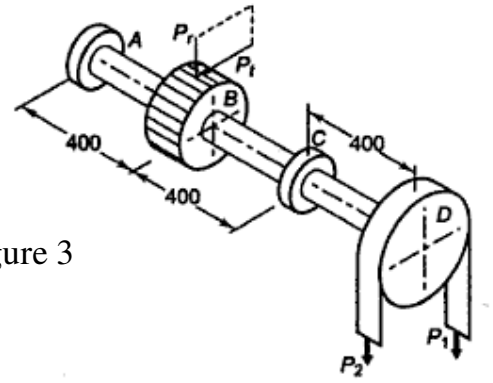


Figure 3

7. (a) What is the difference between a clutch and coupling?
   (b) Design a bush type flexible coupling to transmit 50 kW at 300 rpm to a compressor. Select your own material and factor of safety.

8. (a) What are the different styles of ends for the helical compression springs? State the relation between active and inactive coils for each type.
   (b) Design a helical valve spring for an operating load range of 100 N to 150 N. The deflection of the spring is 7.5 mm for this range. Take yield strength in shear is 700 MPa, factor of safety is 1.5 and modulus of rigidity is 80 GPa.

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Code No: R31045 **R10** **Set No: 1**

III B.Tech. I Semester Regular Examinations, November/December - 2012

ANTENNAS AND WAVE PROPAGATION

(Electronics and Communications Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

*****

1. Define and explain the following terms:
   (i) Directivity
   (ii) Gain
   (iii) Aperture Efficiency

(b) An antenna has a radiation resistance of 72Ω, a loss resistance of 8Ω and a power gain of 12 dB. Determine the antenna efficiency and its directivity.

2. (a) Derive the expressions for radiation fields from a vertical λ/2 radiator and hence prove that it has a radiation resistance of about 73Ω. List all the assumptions involved in it.
   (b) Define radiation resistance of an antenna. Calculate the radiation resistance of a λ/10 wire dipole in free space.

3. (a) What is a broadside array? Explain in detail the structure, radiation pattern and the principle of operation of such an antenna
   (b) For an broadside array consisting of several half wave length long isotropic radiators is to have a directive gain of 30. Find the array length and width of the major lobe.

4. (a) With a neat sketch, explain Rhombic Antennas.
   (b) Calculate in dB the directivity of 20 turn helix having $\alpha=12^0$, circumference equal to one wavelength.

5. (a) A parabolic dish provides a gain of 75 dB at a frequency of 15 GHz. Calculate the capture area of the antenna, its 3dB and null beam widths.
   (b) Define parabola. Show that by sketches how its geometry makes it a suitable basis for antenna reflectors. Why an antenna employing a paraboloid reflector is likely to be a highly directive receiving antenna? Explain.

6. (a) Explain the principle of operation of Len's antenna with neat sketches.
   (b) Calculate the index of refraction of dielectric lens formed with radial distance from centre of sphere is 0.5m and radius of sphere is 0.39m.

7. (a) Write short notes on the following:
   (i) Maximum usable frequency
   (ii) Effect of earth's magnetic field on ionosphere propagation
   (b) A radio communication link is to be established via ionosphere. Take maximum virtual height to be 100Km at the midpoint of the path. Assume critical frequency to be $2x10^6$ Hz and distance between stations to be 600Km. Find.
   (i) Optimum working frequency
   (ii) Angle of elevation of beam

8. (a) Explain space wave propagation with its limitations.
   (b) A 150m antenna transmitting at 1.2MHz by ground wave has an antenna current of 8A. What voltage is received by the receiving antenna 40Km away, with a height of 2m.

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Code No: R31045 **R10** **Set No: 2**

III B.Tech. I Semester Regular Examinations, November/December - 2012

ANTENNAS AND WAVE PROPAGATION

(Electronics and Communications Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions

All Questions carry

*****

1. (a) Define & Give the significance of each of the following:
   i. Radiation Intensity
   ii. Effective Antenna Height
   iii. Beam efficiency
   iv. Aperture Efficiency

   (b) An isotropic antenna radiates equally in all the directions. The total power delivered to the radiator is 100 Kw. Calculate the power density at a distances of.
   (i) 100 meters. (ii) 1000 meters.

2. (a) Explain the concept of retarded scalar and vector potentials.
   (b) If maximum current in the antenna is 20 amps, find the field intensity at a distance of 2 Kms along the axis perpendicular and at an angle 30^0 from the antenna.

3. (a) Derive an expression for the array factor of two isotropic elements in.
   i. Broadside array
   ii. End fire array

   (b) A uniform linear array consisting of 16 isotropic point sources with a spacing of λ/4. If the phase difference is equal to -90^0. Calculate
   (i) HPBW , (ii)Beam solid angle (iii) Beam efficiency (iv)Directivity

4. (a) Explain the construction, operation and design consideration for a Helical antenna.
   (b) Design a helical antenna with a directivity of 15 dB that is operating in the axial mode and whose polarization is nearly circular. The spacing between the turns is λ/10. Determine the following:
   (i) Number of turns (ii) Axial ratio
   (iii) Progressive phase shifts (in degrees) between turns to achieve axial mode radiation.

5. (a) Explain the methods of feeding a paraboloid reflector in detail.
   (b) Calculate the beamwidth between first nulls & gain in dB for a 2.5m paraboloid reflector used at 6GHz.

6. (a) Show a microwave bench setup suitable for antenna measurements. Explain how antenna gain can be measured using this bench setup. What are the precautions necessary to minimize errors in the above measurement?
   (b) While measuring gain of a horn antenna the gain oscillator was set for 9.00GHz frequency and the attenuation inserted was found to be 9.8dB. Calculate the gain of the horn if the distance between two horn was 35cm.

7. (a) Derive the expression for refractive index of ionosphere and critical frequency.
   (b) Assume that the reflection takes place at a height of 400km and maximum density corresponds to 0.9 refractive index at 10MHz. What will be the range for which MUF is 10MHz? [For flat & for curved earth]

8. (a) Explain the mechanism by which the space wave propagates. What is meant by radio horizon?
   (b) A VHF communication is established with 35W transmitter at 90MHz. Find the distance upto which the LOS communication may be possible, if the heights of Tx & Rx antennas are 40m & 25m. Also find field strength at receiving end.

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Code No: R31045 **R10** **Set No: 3**

III B.Tech. I Semester Regular Examinations, November/December - 2012

ANTENNAS AND WAVE PROPAGATION

(Electronics and Communications Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions

All Questions carry

*****

1. (a) Differentiate scattering loss aperture, collecting aperture & physical aperture of antenna.
   (b) In a microwave communication link, two identical antennas operating at 10 GHz are used with power gain of 40 dB. If the transmitter power is 1W. Find the received power, if the range of the link is 30Km.

2. (a) Explain loop antennas in detail
   (b) A grounded vertical antenna has an effective height of 113.3m and operates at a wavelength of 18.8 Km with a r.m.s. value of base current 725A. Find E and H fields at a distance of 175 Km and its power radiated.

3. (a) Briefly explain the following:
   1. Principle of pattern multiplication
   2. Binomial array

   (b) A linear broadside array consists of four equal isotropic inphase point sources with $\lambda/3$ spacing & overall length of the array is λ. Find the directivity & beam width.

4. (a) Explain different modes of operation of helical antenna in detail.
   (b) Find number of turns, turn diameter and axial ratio of right circularly polarized axial mode helical antenna with 17dB gain for operation at 1600MHz with turn spacing λ/π.

5. (a) Describe the constructional details and principles of operation of parabolic reflector. Discuss the relative merits and demerits of these antennas.
   (b) A paraboloid reflector antenna with diameter 20mts. It is designed to operate at 6GHz and illumination efficiency of 0.54. Calculate the antenna gain in decibels.

6. (a) With a neat sketch explain the different types of horn antennas. Mention merits and demerits of each type.
   (b) With the test antenna connected, the detector output meter is adjusted to read full scale or zero decibels. Now with the standard calibrated antenna connected, the output is down 7dB. If the gain of the calibrated antenna is 15dB, calculate the gain of the antenna under test.

7. (a) Write short notes on skip distance.
   (b) At a 150km height in the ionosphere, the electron density at night is about $2x10^{12}$ m^{-3} and the signal MUF is 1.5 times the critical frequency for a transmission distance of 600Km. Compute the following:
   (i) Critical frequency (ii) Relative dielectric constant (iii) Phase constant
   (iv) Wave impedance (v) Wave velocity (vi) Group velocity (vii) Incident angle

8. (a) Explain the following:
   1. Duct propagation
   2. Path losses

   (b) Two aircrafts are flying at altitudes of 3000m and 5000m respectively. What is the minimum possible distance along the surface of the earth over which they can have effective point to point microwave communication? Radius of earth is $6.37x10^{6}$m.

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Code No: R31045 **R10** **Set No: 4**

III B.Tech. I Semester Regular Examinations, November/December - 2012

ANTENNAS AND WAVE PROPAGATION

(Electronics and Communications Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions

All Questions carry

*****

1. (a) Explain the following terms:
   i. Antenna effective height
   ii. Antenna aperture
   iii. Current distribution on a thin wire antenna

   (b) The radiation resistance of an antenna is 72Ω and loss resistance is 8Ω. What is the directivity in dB if the power gain is 16.

2. (a) Obtain expression for potential fields due to sinusoidally varying sources and bring out the importance of Lorentz guage condition.

   (b) An Antenna whose effective height of 100m at a frequency of 60KHz radiated 100KW of power. Determine the strength of the electric field at a distance of 100Km from the antenna. Neglect ground effect and atmospheric losses.

3. (a) Discuss the conditions under which an array of antenna will behave either as a broadside array or an end fire array.

   (b) A broadside array operating at 100cm wavelength consists of four halfwave dipoles spaced 50cm. Each element carries radio frequency current in the same phase and of magnitude 0.5 amperes. Calculate
   (i) Radiated power
   (ii) Half width of the major lobe.

4. (a) Explain the following terms:
   i. Long wire antennas
   ii. V antennas

   (b) Design a five turn helical antenna which at 300MHz operates in the axial mode and possesses circular polarization in the major lobe. Determine the following:
   (i) Near optimum circumference (in λ and in meters)
   (ii) Spacing (in λ and in meters) for near optimum pitch angle design
   (iii) Input impedance (iv) Axial ratio

5. (a) Explain the following terms:
   i. Yagi-uda arrays
   ii. Corner reflectors

   (b) Calculate the angular aperture for a paraboloid reflector antenna for which the aperture number is
   (i) 0.25
   (ii) 0.50
   (iii) 0.60

   Given the diameter of the reflector mouth is 10m. Calculate the position of the focal point with reference to the reflector mouth in each case

6. (a) Explain the procedure for measuring the Directivity of antenna.
   (b) Calculate the minimum distance required to measure the field pattern of an antenna of diameter 2m at a frequency of 3GHz. Derive the necessary equations.

7. (a) Discuss the effects of earth's magnetic field on ionosphere radio wave propagation.
   (b) Communication by ionosphere propagation is required for a distance of 200Km. Height of the layer is 220Km and critical frequency is 5MHz. Find Maximum Usuable Frequency.

8. (a) Explain the Tropospheric wave propagation.
   (b) Determine the height of the transmitting antenna to obtain a maximum distance of transmission upto 38km from a 24 meter high receiving antenna.

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Code No: R31055 **R10** **Set No: 1**

III B.Tech. I Semester Regular Examinations, November/December - 2012
MICRO PROCESSORS AND MULTICORE SYSTEMS
(Computer Science and Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks
*****

1. (a) Explain the register set of 8086 processor.
   (b) What is addressing mode? Explain different type of addressing modes in 8086 with examples.

2. (a) List out and explain conditional jump instructions of 8086 with example.
   (b) Write an ALP to multiply a two 32bit number & store the 64-bit product in memory.

3. (a) Differentiate between Macros & Procedures with an examples.
   (b) Write an ALP to find the GCD of four, 8-bit numbers using a procedure.

4. (a) What are assembler directives? Explain the significance of the following assembler directives with suitable examples. i) LENGTH ii)TYPE iii)DB iv)EQU
   (b) Write an ALP to convert a 3- digit BCD number to binary number.

5. (a) What is the interrupt vector table? Draw and explain the interrupt vector table for 8086.
   (b) Describe the response of 8086 processor, when interrupt coming on INTR.

6. (a) List out and Explain bit level instructions of 8086 with examples.
   (b) Write an ALP to count number of positive & negative numbers in an array of N-numbers.

7. (a) Explain the function of the following 80386 pins: i) $\overline{ERROR}$; (ii) $\overline{PEREQ}$; (iii) $\overline{LOCK}$; (iv) $\overline{READY}$; (v) $\overline{ADS}$; (vi) $\overline{RESET}$; (vii) $D/\bar{C}$; (viii) $\overline{NA}$;
   (b) Write a note on the internal programming model of 80486 & depict the EFLAG register in detail.

8. (a) Write a note on Pentium Processor?
   (b) Compare dual core & Core due with respect to basic characteristics and architecture.

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Code No: R31055 **R10** **Set No: 2**

III B.Tech. I Semester Regular Examinations, November/December - 2012
MICRO PROCESSORS AND MULTICORE SYSTEMS
(Computer Science and Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks
*****

1. (a) Explain the segmentation in 8086 processor. What are the advantages of segmentation in 8086?
   (b) Draw & Explain the internal architecture of 8086

2. (a) Determine whether the following instructions are valid or not. If valid, explain their operation & flags affected, if not, mention the reason.
   i) XLAT AL ii) MOV BX,[DX] iii) NOT 34h
   iv) AAD v) TEST OPRI, OPR2 vi) JNGE label.
   (b) Write a 8086 ALP to add two- 64 bit numbers and store result in suitable memory locations.

3. (a) Write an ALP that displays a carriage return & a line feed using a MACRO?
   (b) Differentiate between Macros & Procedures with an example.

4. (a) What is assembler directive?. Explain the following directives with example.
   i) ASSUME ii)EQU iii)ENDS iv)EXTRN
   (b) Explain the following instructions with examples.
   i) AAA ii) LOOPNE iii) AAM iv) TEST

5. (a) What is interrupt? How operation takes place and Explain different types of interrupts in 8086?
   (b) Write difference between hardware and software interrupts of 8086 processor.

6. (a) List out and explain bit level instructions of 8086 with examples.
   (b) Write an ALP to convert 4-digit BCD to ASCII.

7. (a) Explain the following with respect to Pentium Processor:
   i) Branch Prediction logic ii) Cache structure
   (b) Explain the structure of special 80386 registers.

8. (a) Explain the basic feature of Pentium Processor
   (b) Compare dual core & Core due with respect to basic characteristics and architecture
*****

Code No: R31055 **R10** **Set No: 3**

III B.Tech. I Semester Regular Examinations, November/December - 2012
MICRO PROCESSORS AND MULTICORE SYSTEMS
(Computer Science and Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks
*****

1. (a) With reference to 8086 CPU, explain the role of the following :
   (i). Instruction queue; (ii) Segment registers; (iii) General purpose registers
   (b) Find out machine codes for the following 8086 instructions.
   (i) MOV AX, BX; ii) ADD [BX], AX (iii) ADD AX, 1234H
   (iv) ADC [BX] [1234], CX.

2. (a) Discuss the following 8086 instructions with example.
   (i) CWD ii) IDIV iii) AAS iv) SAR
   (b) Write an ALP to arrange 'N' numbers in ascending order using bubble sort technique.

3. (a) Write program to check whether the entered string is palindrome or not. Accept the string through keyboard & print a suitable message, as "PALINDROME" or "NOT PALINDROME".
   (b) Differentiate between Macros & procedures with an example.

4. (a) What are assembler directives? Explain the following directives with example.
   i) INCLUDE ii) ORG iii) END P iv) PROC
   (b) List out and explain bit manipulation instructions of 8086.

5. (a) Explain interrupt operation? Compare software & hardware interrupts in 8086.
   (b) Explain interrupt vector table of 8086.

6. (a) List and explain all ASCII related instructions in 8086 with examples.
   (b) Write an ALP to transfer 10 words of data using REP MOV SW instruction from source location to destination location. What is the role of SI, DI registers & DF bit.

7. (a) Draw & explain internal architecture of 80286 CPU?. Features of Pentium processor over previous processors.
   (b) Differentiate between 80386 & 80486 processor.

8. (a) With a neat diagram Explain the architecture of Pentium Processor
   (b) Compare dual core & Core due with respect to basic characteristics and architecture
*****

Code No: R31055 **R10** **Set No: 4**

III B.Tech. I Semester Regular Examinations, November/December - 2012
MICRO PROCESSORS AND MULTICORE SYSTEMS
(Computer Science and Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks
*****

1. (a) List the major steps in developing an assembly language programming.
   (b) Explain the register set of 8086 processor.

2. (a) Write a delay loop which produces a delay of 500 μsec on an 8086 with a 5MHz clock.
   (b) Explain standard program structures in 8086 such as SEQUENCE, IF-THEN-ELSE, WHILE-DO and REPEATE-UNTIL.

3. (a) List the string primitives. Explain with suitable examples.
   (b) Write a 8086 ALP to reverse a string given below.
   "ANDHRAPRADESH"

4. (a) What are assembler directives? Explain the following directives with examples.
   i) DB(?) ii) EQU 40h iii) GLOBAL iv) GROUP
   (b) Differentiate between the following instructions & explain with suitable examples.
   i) Shift & Rotate ii) HLT & INT-4 iii) JMP & CALL

5. (a) Explain interrupt operation? Compare software & hardware interrupts in 8086.
   (b) Write a scheme to generate NMI on power failure & Explain.

6. (a) List and Explain all string related instructions in 8086 with examples.
   (b) Write an ALP to find sum of even & odd numbers in a given array of N numbers.

7. (a) What is pipelining? How does cache memory enhance the performance of Pentium Microprocessors?
   (b) Discuss briefly the two modes of operation in 80386.

8. (a) Compare different Pentium Processors.
   (b) Compare dual core & Core due with respect to basic characteristics and architecture.

*****

Code No: V3111 **R07** **Set No: 1**

III B.Tech. I Semester Supplementary Examinations, November/December - 2012

ELECTRICAL MACHINES-III

(Electrical and Electronics Engineering)

Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

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1. a) Distinguish between integral slot and fractional slot windings and their merits and demerits.
   b) Calculate the speed and open circuit line and phase voltages of a 4-pole,3-phase, 50 Hz, star-connected alternator with 36 slots and 30 conductors per slot. The flux per pole is 0.0496Wb and is sinusoidally distributed.

2. a) What happens to the value of synchronous reactance if air gap is increased?
   b) What is a synchronous impedance? How can it be determined experimentally?
   c) Briefly explain the load characteristics of an alternator.

3. a) How do you calculate synchronous impedance experimentally?
   b)A 100kVA,3000V,50Hz 3-phase star –connected alternator has effective armature resistance of 0.2 ohms. The field current of 40A produce short-circuit current of 200A and an open circuit e.m.f of 1040V(line). Calculate the full-load voltage regulation at 0.8 p.f. lagging and 0.8 p.f. leading. Draw phasor diagrams.

4. a) What conditions must be fulfilled before an alternator can be connected to an infinite bus?
   b) Two 750 kW alternators operate in parallel. The speed regulation of one set is 100% to 102% from full-load to no-load and that of the other is 100% to 104%. How will the two alternators share a load of 1000kW and at what load will one machine cease to supply any portion of the load?

5. a) What are the salient features of a synchronous motor?
   b) A 3-phase ,500V,star connected synchronous motor gives net output of 17kW on full load operating at 0.9 lagging power factor. Its armature resistance is 0.8Ω per phase. The mechanical losses are 1300W. Estimate the current drawn by the motor and full load efficiency.

6. a) Explain the power circle diagrams of the synchronous motor.
   b) Why it is necessary to increase the excitation to obtain minimum current with the application of load.

7. a) Explain how the performance of a single phase induction motor is estimated from the equivalent circuit?
   b) Find the mechanical power output of a 185 watts,4 pole 110 volts,50Hz single phase induction motor whose constants are given below at a slip of 0.05.
   R_1=1.86Ω X_1=2.56 Ω m=53.5 Ω R_2=3.56 Ω X_2=2.56 Ω
   Core loss=40 watts; friction and windage losses= 13.0 watts.

8. a) Compare the constructional features of A.C series motor with D.C series motor.
   b) Write a note on universal motor.

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Code No: V3111 **R07** **Set No: 2**

III B.Tech. I Semester Supplementary Examinations, November/December - 2012

ELECTRICAL MACHINES-III

(Electrical and Electronics Engineering)

Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

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1. a) Derive an expression for an induced e.m.f in a synchronous generator. Also explain how the e.m.f. is having sinusoidal waveform.
   b) A 3 phase , 16 pole ,star connected alternator has 144 slots on the armature periphery. Each slot contains 10 conductors. It is driven at 375 r.p.m. The line value of e.m.f available across the terminals is observed to be 2.657kV. Find the frequency of the induced e.m.f and the flux pre pole.

2. a) Draw the phaser diagram of the loaded alternator for the following conditions: (i) lagging power factor (ii) leading power factor.
   b) Why harmonics are generated in the e.m.f of an alternator? Discuss its effects on total generated e.m.f

3. a) Explain the two reaction theory applicable to salient pole synchronous machine.
   b) A 3-phase alternator has a direct-axis synchronous reactance of 0.7 p.u and a quadrature axis synchronous reactance of 0.4 p.u. Draw the vector diagram for full load 0.8 p.f. lagging and obtain there from (i) the load angle and (ii) the no -load per unit voltage.

4. a) Define the significance of transient and sub-transient reactance in an alternator.
   b) A 5000kVA,10kV,1500 r.p.m.,50Hz alternator runs in parallel with other machines. Its synchronous reactance is 20%. Find the synchronizing power per unit mechanical angle of the phase displacement for (i) No load and (ii) Full load at0.8 p.f. lag.
   Also calculate the synchronizing torque if the mechanical displacement is 0.50.

5. a) Explain V and inverted V curves.
   b) A 3-phase,3300V,star connected synchronous motor has an effective resistance and synchronous reactance of 2.0Ω and 18.0Ω per phase respectively. If the open circuit generated e.m.f. is 3800V between lines, calculate.
   (i) The maximum total mechanical power that the motor can developed and
   (ii) The current and power factor at the maximum mechanical power.

6. Is the synchronous motor self-starting? If not, what are the methods adopted for starting it?

7. a) Describe cross field theory as applied to single phase induction motor.
   b) The following tests results were obtained in respect of 230 volts single phase induction motor:
   No load tests: 230V, 6.25A, 360 watts
   Locked rotor tests: 126V, 15.0A, 577 watts
   Stator winding resistance= 1.5 ohms
   Draw the equivalent circuit diagram with parameters.

8. a) Explain the principle of operation of permanent magnet motors
   b) Write a note on hysteresis motor and its applications.

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Code No: V3111 **R07** **Set No: 3**

III B.Tech. I Semester Supplementary Examinations, November/December - 2012

ELECTRICAL MACHINES-III

(Electrical and Electronics Engineering)

Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

*****

1. a) Derive the expressions for distribution and pitch factors.
   b) A single phase 1500 r.p.m,4 pole alternator has 8 conductors per slot with total of 24 slots. The winding is short pitched by $1/6^{th}$ of full pitch. Assume distributed winding with flux per pole as 0.05Wb.Calculate the induced e.m.f.

2. a) Explain the phenomena of armature reaction when an alternator is delivering a load current at (i) purely lagging p.f, (ii) unity p.f. and (iii) purely leading p.f.
   b) What do you mean by synchronous reactance. Explain the term synchronous impedance of the alternator

3. a) Explain the terms direct axis synchronous reactance and quadrature-axis synchronous reactance of a salient –pole alternator. On what factors do these values depend?
   b) A 30 kVA,440V,50Hz,3-phase,star-connected alternator gave the following test data:

Field current(A)	:	2	4	6	7	8	10	12	14
Terminal voltage(V):		155	287	395	440	475	530	570	592
S.C current(A)	:	11	22	34	40	46	57	69	80

   Resistance between any two terminals is 0.3 ohms. Find the regulation at full load,0.8 p.f. lagging, by MMF method.

4. a) Derive the expression for load sharing between the dissimilar alternators.
   b) Two exactly similar turbo –alternators are rated 20MW each. They are running in parallel. The speed-load characteristics of the driving turbines are such that the frequency of alternator 1 drop uniformly from 50Hz on no-load to 48Hz on full load, and that of alternator 2 from 50Hz to 48.5Hz.How will the two machines share a load of 30MW ?

5. a) Derive the torque developed in a synchronous motor.
   b) A 15kW,400V, 50Hz, 3-phase star connected synchronous motor with impedance of (1+j5.0)Ω/phase is working at rated voltage and rated frequency. Find the load angle, armature current and power factor when the excitation is adjusted to 480V.

6. a) Show that the current locus of a synchronous motor developing constant power is a circle. Determine its center and radius.
   b) What are the various methods of making synchronous motors self starting?

7. a) Explain what is meant by the split-phase method of motor starting.
   b) A 220V,50Hz,4 pole single phase induction motor has the following equivalent circuit parameters.
   R_1=3.6 ohms X_1=X_2= 15.6 ohms; R_2=6.8 ohms; X_0=96 ohms
   The rotational losses of the motor are estimated to be 80 watts. Calculate the current, power factor and efficiency when the motor is running 1410 r.p.m.

8. a) Write a note on reluctance motor and its applications.
   b) Explain about universal motor with neat diagrams.

*****

Code No: V3111 **R07** **Set No: 4**

III B.Tech. I Semester Supplementary Examinations, November/December - 2012

ELECTRICAL MACHINES-III

(Electrical and Electronics Engineering)

Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

*****

1. a) Describe the main constructional features of alternator.
   b) A 3-phase 4-pole synchronous generator has a double layer winding having four turns per coil placed in a total of 48 slots. If the flux per pole of the generator is 0.05 Wb and speed of the rotor is 1500 r.p.m, calculate the magnitude of generated voltage per phase.

2. a) Draw and explain the phasor diagram of alternator under loaded conditions.
   b) A 4-pole ac machine has a 3-phase winding wound in 60 slots. The coils are short pitched in such a way that if one coil side lies in slot number 1,the other side of the same coil lies in slot number 13.Calculate the winding factor for (a) fundamental, (b) third harmonic and (c) fifth harmonic frequency wave forms.

3. a) Explain the merits and demerits of E.M.F and M.M.F. methods. Explain what are the assumptions made in each case.
   b) Calculate from the observations taken on a 125kVA, 400V,3-phase alternator, the % regulation for half load condition at 0.8 leading p.f. Oc test observation:

I_f(A) :	0	2	4	6	8	10
V_{OC} (V_{line}):	0	80	140	200	250	300

   While full load current is obtained on short circuit condition at a field current of 8A. Assume star connection and R_a=0.1Ω/ph. The short circuit current variation with respect to field current is linear.

4. a) Discuss load sharing between two alternators.
   b) Two single phase alternators operate in parallel and supply a load impedance of (3+j4)Ω. If the impedance of the machine is (0.2+j2) and e.m.f.s are (220+j0) and (220+j0) volts respectively, determine for each machine (i) terminal voltage(ii) power factor and (iii)output.

5. a) Explain the principle of operation of a synchronous motor.
   b) A 750 kW,11kV,3-phase star connected synchronous motor has a synchronous reactance of 35Ω/phase and negligible resistance. Determine the excitation e.m.f. per phase when the motor is operating on full load at 0.8 p.f. leading. Its efficiency under this condition is 93%.

6. a) Explain the effect of variable excitation on the behavior of the synchronous motor under constant load condition.
   b) Explain the methods of starting the synchronous motors.

7. a) Explain the principle of operation and constructional features of a single phase induction motor.
   b) A laboratory test on single phase induction motor has given the following data with rotational losses being equal to 17W.
   Noload tests: 110V 2.8A 60W
   Blocked rotor tests: 110V 14.8A 1130W
   Determine the parameters of the equivalent circuit.

8. a) Explain about single phase A.C. series motor with neat diagrams.
   b) Explain about permanent magnet D.C motor with neat diagrams and give its applications.

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Code No: V3113 **R07** **Set No: 1**

III B.Tech. I Semester Supplementary Examinations, November/December - 2012

DESIGN OF MACHINE MEMBERS - I

(Mechanical Engineering)

Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions

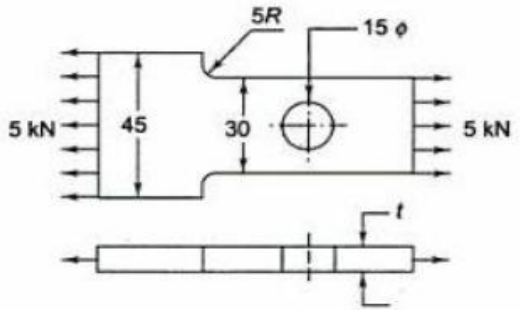
All Questions carry equal marks

*****

1. (a) Compare the Distortion energy theory and maximum shear stress theory.
   (b) A 50 mm diameter non rotating shaft of steel with yield strength of 400 MPa is subjected to a steady torque of 1500 Nm. Find the permissible steady bending moment that can be superimposed on it if the factor of safety is 5. Use Von-Mises theory. Locate the loading point in the Von-Mises ellipse.

2. (a) What is stress concentration? What are the different methods to reduce stress concentration?
   (b) A flat plate is subjected to a tensile force of 5 kN as shown in figure 1. The plate material is grey cast iron FG 200 and the factor of safety is 2.5. Determine the thickness of the plate. All the dimensions are in mm onlv.

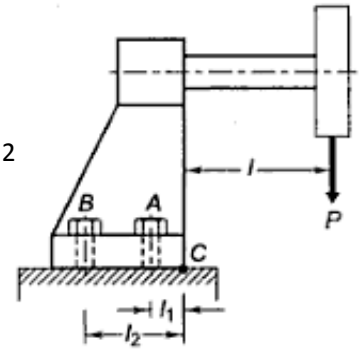
Figure 1



3. (a) Define the efficiency of the riveted joint. According to Indian Boiler Regulations, what is the highest efficiency required of a riveted joint?
   (b) A double riveted lap joint with chain riveting is to be made for joining two plates 10 mm thick. The allowable stresses are 60 MPa in tension, 50 MPa in shear and 80 MPa in crushing. Find the rivet diameter, pitch of rivets and distance between rows of rivets. Also find the efficiency of the joint.

4. A cast iron bracket, supporting the transmission shaft and the belt pulley, is fixed to the steel structure by means of four bolts as shown in Figure 2. There are two bolts at A and two bolts at B. The tensions in slack and tight sides of the belt are 5 kN and 10 kN respectively. The belt tensions act in a vertically downward direction. The distances are l_1 = 50 mm, l_2 = 150 mm and l = 200 mm. The maximum permissible tensile stress in the bolt is 60 N/mm^2. Specify a suitable bolt size.

Figure 2



5. (a) Where do you use cotter joint? Give practical examples.
   (b) Design and draw a cotter joint to support a load varying from 30 kN in compression to 30 kN in tension. The material used is carbon steel for which the following allowable stresses may be used. The load is applied statically. Tensile stress = compressive stress = 50 MPa; shear stress = 35 MPa and crushing stress = 90 MPa.

6. A shaft is supported by two bearings 400 mm apart and carries a bevel gear of 200 mm pitch diameter at one end that is overhanging beyond the nearer bearing by 150 mm. The gear produces a radial load of 9.8 kN and a thrust load of 2.94 kN when the speed is 600 rpm. Determine the shaft diameter if the shaft is made of steel with allowable shear stress of 40 MPa. Also determine the angle of twist and deflection at the bevel gear location if the modulus of rigidity is 80 GPa and the modulus of elasticity is 210 GPa.

7. (a) What is the difference between rigid and flexible coupling?
   (b) Design a cast iron flange coupling for joining two mild steel shafts transmitting 100 kW at 250 rpm. The angle of twist should not exceed 1^0 in a length of 25 diameters. Take yield strength in shear for the shaft is 40 MPa and for bolts is 28MPa.

8. (a) What is surge in spring? What are the methods to avoid the surge in spring?
   (b) Design a closed coil helical spring for a boiler safety valve which is required to blow off steam at pressure of 1.5 MPa. The diameter of the valve is 50 mm. The initial compression of the spring is 40 mm and the lift is limited to 20 mm.

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Code No: V3113 **R07** **Set No: 2**

III B.Tech. I Semester Supplementary Examinations, November/December - 2012

DESIGN OF MACHINE MEMBERS - I

(Mechanical Engineering)

Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

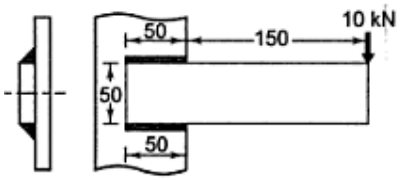
*****

1. (a) Derive the relationship between the yield strength in shear and the yield strength in tension using the Distortion energy theory.
   (b) A machine element is subjected to principal stresses of 120 MPa, 0 MPa and -90 MPa. The material used is 30C8. Calculate the factor of safety by (a) the maximum normal stress theory, (b) the maximum shear stress theory and (c) the Distortion energy theory

2. (a) What is fatigue stress concentration factor? In what way, it is different from the theoretical stress concentration factor.
   (b) A machine part is made of forged steel with ultimate strength of 630 MPa and endurance strength is 0.22 times ultimate strength. The life of the part is 250000 cycles. The loading for the 50% of the time is ± 225 MPa and for 30% of the time is ± 145 MPa. Calculate the loading during the remaining time.

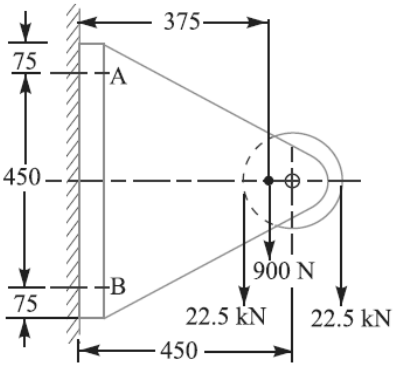
3. (a) What are primary and secondary shear stresses in eccentrically loaded welded joints? What are the assumptions made in evaluating them?
   (b) A welded connection of steel plates, as shown in Figure 1, is subjected to an eccentric force of 10 kN. Determine the throat dimension of the welds, if the permissible shear stress is limited to 95 MPa

Figure 1



4. A pulley bracket, as shown in Figure 2, is supported by 4 bolts, two at *A-A* and two at *B-B*. Determine the size of bolts using an allowable shear stress of 25 MPa for the material of the bolts. List the assumptions made in the analysis.

Figure 2



5. (a) What is knuckle joint? Give practical examples.
   (b) Design a knuckle joint to connect two circular rods subjected to an axial tensile force of 50 kN. The material for the two rods and pin is selected as plain carbon steel of Grade 30C8 with yield strength 400 MPa. Assume factor of safety of 5. Specify the dimensions of the knuckle joint with a neat sketch.

6. (a) Which theory is commonly used for the design of the shafts? Explain why?
   (b) An electric motor drives a machine through a pair of spur gears. The pinion is mounted on motor shaft and over hangs by 200 mm from the nearest bearing. The pinion has 20 teeth of 10 mm module and 200 involute profile. Design the motor shaft to transmit 15 kW at 1200 rpm. Use safe shear stress value of 40 MPa. Take the shock and fatigue correction factors as 1.2 and 1 respectively.

7. (a) What is the difference between protected and unprotected rigid flange coupling?
   (b) A driving shaft is joined with coaxial driven shaft through a muff coupling. The shaft transmits 60 kW of power at 150 rpm. Design the shaft, key and muff. Assume a factor of safety of 5 with following ultimate strength values.
   Ultimate shear strength for shaft = 300 N/mm^2
   Ultimate shear strength for key = 200 N/mm^2
   Ultimate shear strength for muff = 50 N/mm^2
   Ultimate compressive strength for key = 500 N/mm^2

8. (a) What are the different types of stresses induced in the wire of helical springs? Sketch its distribution.
   (b) From a toy gun, a bullet of 1 N is fired. The bullet travels a distance of 10 m. the compression of the spring when the gun is loaded is 100 mm and the bore of the barrel is 20 mm. Design a suitable spring.

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Code No: V3113 **R07** **Set No: 3**

III B.Tech. I Semester Supplementary Examinations, November/December - 2012

DESIGN OF MACHINE MEMBERS - I

(Mechanical Engineering)

Time: 3 Hours **Max Marks: 80**

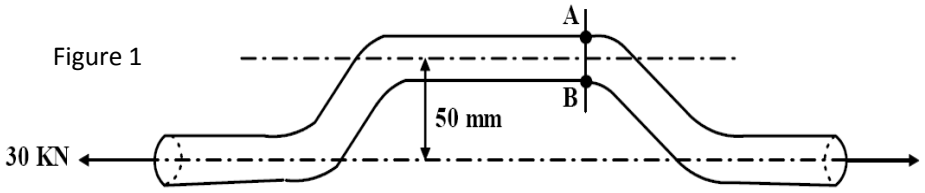
Answer any FIVE Questions

All Questions carry equal marks

*****

1. (a) Derive the Von Mises effective stress equation using the principal stresses.
   (b) A 100 mm diameter off-set link is transmitting an axial pull of 30 KN as shown in the figure 1. Find the stresses at points A and B.

Figure 1



2. (a) Compare the Soderberg, Goodman and Gerber diagrams for the zero variable stresses.
   (b) A machine component is subjected to fluctuating stress that varies from 40 to 100 N/mm^2. The corrected endurance limit stress for machine component is 270 N/mm^2. The ultimate and tensile strength of the material are 600 and 450 N/mm^2 respectively. Find the factor of safety using (i) Soderberg line, (ii) Goodman line and (iii) Gerber theory. Also, find the factor of safety against static loading.

3. (a) How is a rivet joint of uniform strength designed?
   (b)Two lengths of mild steel tie rod having width 200 mm are to be connected by means of Lozenge joint with two cover plates to withstand a tensile load of 180 kN. Completely design the joint, if the permissible stresses are 80 MPa in tension; 65 MPa in shear and 160 MPa in crushing. Draw a neat sketch of the joint.

4. A bearing shown in Figure 2 is fastened to a frame by 6 bolts spaced equally on a 250 mm bolt circle, of which 2 bolts are positioned on the horizontal line. The bearing flange diameter is 300 mm and a load of 50 kN is applied at 275 mm from the frame. Determine the size of the bolts. What are conditions required for the arrangement of the bolts to have the maximum strength. Assume that the bolt is made of C20 steel having yield strength of 245 MPa and Factor of safety 3.

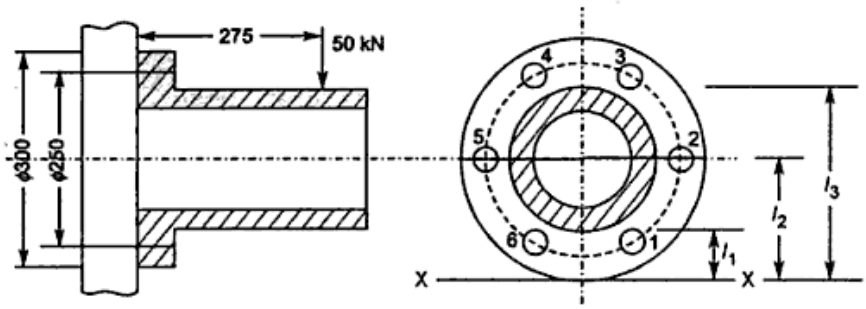


Figure 2

5. (a) Differentiate between a cotter and knuckle joint.
   (b) Design a spigot and socket joint to connect two rods of 30C8 steel to carry an axial tensile and compressive load of 10 kN. Explain the construction of the joint with a neat sketch

6. A steel shaft 800 mm long transmitting 15 kW at 400 r.p.m. is supported at two bearings at the two ends. A gear wheel having 80 teeth and 500 mm pitch circle diameter is mounted at 200 mm from the left hand side bearing and receives power from a pinion meshing with it. The axis of pinion and gear lie in the horizontal plane. A pulley of 300 mm diameter is mounted at 200 mm from right hand side bearing and is used for transmitting power by a belt. The belt drive is inclined at 30° to the vertical in the forward direction. The belt lap angle is 180 degrees. The coefficient of friction between belt and pulley is 0.3. Design and sketch the arrangement of the shaft assuming the values of safe stresses as: τ = 55 MPa; σ_t= 80 MPa. Take torsion and bending factor 1.5 and 2 respectively .

7. (a) Sketch a muff coupling and identify its advantages and disadvantages.
   (b) A shaft transmitting 150 kW is to be connected to a coaxial shaft through cast iron flange coupling. The shaft runs at 120 rpm. The key and shaft are to be made of same material for which permissible shearing stress is 60 N/mm^2 and compressive strength is 120 N/mm^2. The steel bolts may be subjected to maximum shearing stress of 26 N/mm^2. Design protected type flange coupling.

8. (a) Derive the expression for the strain energy stored in helical spring in terms of wire diameter, mean coil diameter and number of turns.
   (b) A railway wagon of mass 250 kN moving with a velocity of 2.5 m/s is brought to rest by springs of mean each diameter 350 mm. the maximum deflection of the spring is 210 mm. Find the wire diameter and number of turns. Take modulus of rigidity is 80 GPa and allowable shear stress 600 MPa.

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Code No: V3113 **R07** **Set No: 4**

III B.Tech. I Semester Supplementary Examinations, November/December - 2012

DESIGN OF MACHINE MEMBERS - I

(Mechanical Engineering)

Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

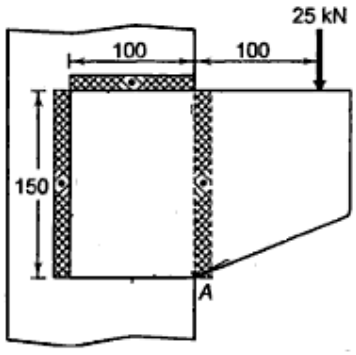
*****

1. (a) Differentiate between (i) Elastic Deformation and Plastic Deformation (ii) Ductility and Brittleness.
   (b)A mass of 50 kg drops through 25 mm at the center of a 250 mm long simply supported beam. The beam has square cross section. It is made of steel 30C8 and the factor of safety is 2. The modulus of elasticity is 207 000 N/mm^2. Determine the dimensions of the cross-section of the beam.

2. A cast iron shaft, with an ultimate tensile strength of 175 MPa, is subjected to a torsional load which is completely reversed. The load is to be applied an indefinite number of cycles. The shaft is 50 mm diameter and is joined to a 75 mm diameter shaft with 12.5 mm radius fillet. The factor of safety is to be 2. What is the maximum torque that can be applied to the shaft? Solve by two methods: (i) using Soderberg Equation (ii) Torsion Equation.

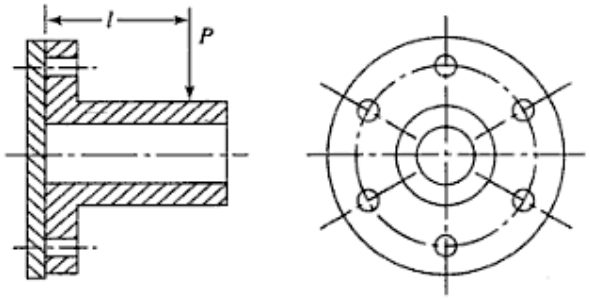
3. An eccentrically loaded bracket is welded to the support as shown in Figure 1. The permissible shear stress for the weld material is 55 N/mm^2 and the load is static. Determine the throat and leg dimensions for the welds. Explain the nature of the stresses induced in the welds.

Figure 1



4. For the circular flange shown in Figure 2, P = 20 kN and l = 100 mm. It is supported by 6 bolts of 30C8 steel at 150 mm pitch circle diameter. Find the diameter of the bolts if the outer diameter of the bracket is 200 mm. Consider Factor of safety = 6. List the assumptions made. Discuss the nature of the force developed in bolts.

Figure 2



5. (a) A heat treated steel shaft of tensile yield strength of 350 MPa has a diameter of 50 mm. The shaft rotates at 1000 rpm and transmits 100 kW through a gear. Select an appropriate rectangular key for the gear.
(b) Draw a neat sketch of a cotter joint and write the equations of failure for the different sections.

6. A transmission shaft supporting a spur gear B and pulley D is shown in figure 3. The shaft is mounted on two bearings A and C. the diameter of the pulley and the pitch circle diameter of the gear are 450 and 300 mm respectively. The pulley transmits 20 kW power at 500 rpm to the gear. The belt tension ratio is 3. The material of the shaft is steel with ultimate strength 700 MPa and yield strength 460 MPa. Take the shock and fatigue correction factors are 1.5 each. The gear and pulley are keyed to the shaft. Determine the diameter of the shaft.

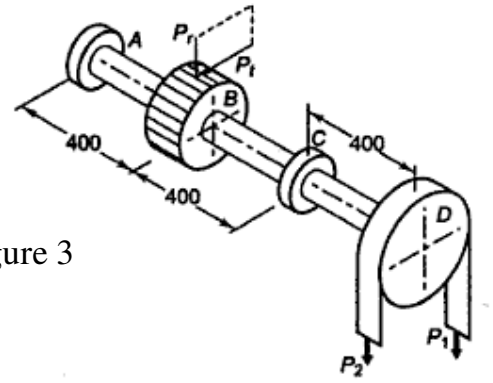


Figure 3

7. (a) What is the difference between a clutch and coupling?
(b) Design a bush type flexible coupling to transmit 50 kW at 300 rpm to a compressor. Select your own material and factor of safety.

8. (a) What are the different styles of ends for the helical compression springs? State the relation between active and inactive coils for each type.
(b) Design a helical valve spring for an operating load range of 100 N to 150 N. The deflection of the spring is 7.5 mm for this range. Take yield strength in shear is 700 MPa, factor of safety is 1.5 and modulus of rigidity is 80 GPa.

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Code No: V3118 **R07** **Set No: 1**

III B.Tech. I Semester Supplementary Examinations, November/December - 2012

ANTENNAS AND WAVE PROPAGATION

(Electronics and Communications Engineering)

Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

*****

1. Define and explain the following terms:
   (i) Directivity
   (ii) Gain
   (iii) Aperture Efficiency

(b) An antenna has a radiation resistance of 72Ω, a loss resistance of 8Ω and a power gain of 12 dB. Determine the antenna efficiency and its directivity.

2. (a) Derive the expressions for radiation fields from a vertical λ/2 radiator and hence prove that it has a radiation resistance of about 73Ω. List all the assumptions involved in it.
   (b) Define radiation resistance of an antenna. Calculate the radiation resistance of a λ/10 wire dipole in free space.

3. (a) What is a broadside array? Explain in detail the structure, radiation pattern and the principle of operation of such an antenna
   (b) For an broadside array consisting of several half wave length long isotropic radiators is to have a directive gain of 30. Find the array length and width of the major lobe.

4. (a) With a neat sketch, explain Rhombic Antennas.
   (b) Calculate in dB the directivity of 20 turn helix having $\alpha=12^0$, circumference equal to one wavelength.

5. (a) A parabolic dish provides a gain of 75 dB at a frequency of 15 GHz. Calculate the capture area of the antenna, its 3dB and null beam widths.
   (b) Define parabola. Show that by sketches how its geometry makes it a suitable basis for antenna reflectors. Why an antenna employing a paraboloid reflector is likely to be a highly directive receiving antenna? Explain.

6. (a) Explain the principle of operation of Len's antenna with neat sketches.
   (b) Calculate the index of refraction of dielectric lens formed with radial distance from centre of sphere is 0.5m and radius of sphere is 0.39m.

7. (a) Write short notes on the following:
   (i) Maximum usable frequency
   (ii) Effect of earth's magnetic field on ionosphere propagation
   (b) A radio communication link is to be established via ionosphere. Take maximum virtual height to be 100Km at the midpoint of the path. Assume critical frequency to be $2x10^6$ Hz and distance between stations to be 600Km. Find.
   (i) Optimum working frequency
   (ii) Angle of elevation of beam

8. (a) Explain space wave propagation with its limitations.
   (b) A 150m antenna transmitting at 1.2MHz by ground wave has an antenna current of 8A. What voltage is received by the receiving antenna 40Km away, with a height of 2m.

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Code No: : V3118 **R07** **Set No: 2**

III B.Tech. I Semester Supplementary Examinations, November/December - 2012

ANTENNAS AND WAVE PROPAGATION

(Electronics and Communications Engineering)

Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry

*****

1. (a) Define & Give the significance of each of the following:
   i. Radiation Intensity
   ii. Effective Antenna Height
   iii. Beam efficiency
   iv. Aperture Efficiency

   (b) An isotropic antenna radiates equally in all the directions. The total power delivered to the radiator is 100 Kw. Calculate the power density at a distances of.
   (i) 100 meters. (ii) 1000 meters.

2. (a) Explain the concept of retarded scalar and vector potentials.
   (b) If maximum current in the antenna is 20 amps, find the field intensity at a distance of 2 Kms along the axis perpendicular and at an angle 30^0 from the antenna.

3. (a) Derive an expression for the array factor of two isotropic elements in.
   i. Broadside array
   ii. End fire array

   (b) A uniform linear array consisting of 16 isotropic point sources with a spacing of λ/4. If the phase difference is equal to -90^0. Calculate
   (i) HPBW , (ii)Beam solid angle (iii) Beam efficiency (iv)Directivity

4. (a) Explain the construction, operation and design consideration for a Helical antenna.
   (b) Design a helical antenna with a directivity of 15 dB that is operating in the axial mode and whose polarization is nearly circular. The spacing between the turns is λ/10. Determine the following:
   (i) Number of turns (ii) Axial ratio
   (iii) Progressive phase shifts (in degrees) between turns to achieve axial mode radiation.

5. (a) Explain the methods of feeding a paraboloid reflector in detail.
   (b) Calculate the beamwidth between first nulls & gain in dB for a 2.5m paraboloid reflector used at 6GHz.

6. (a) Show a microwave bench setup suitable for antenna measurements. Explain how antenna gain can be measured using this bench setup. What are the precautions necessary to minimize errors in the above measurement?
   (b) While measuring gain of a horn antenna the gain oscillator was set for 9.00GHz frequency and the attenuation inserted was found to be 9.8dB. Calculate the gain of the horn if the distance between two horn was 35cm.

7. (a) Derive the expression for refractive index of ionosphere and critical frequency.
   (b) Assume that the reflection takes place at a height of 400km and maximum density corresponds to 0.9 refractive index at 10MHz. What will be the range for which MUF is 10MHz? [For flat & for curved earth]

8. (a) Explain the mechanism by which the space wave propagates. What is meant by radio horizon?
   (b) A VHF communication is established with 35W transmitter at 90MHz. Find the distance upto which the LOS communication may be possible, if the heights of Tx & Rx antennas are 40m & 25m. Also find field strength at receiving end.

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Code No: : V3118 **R07** **Set No: 3**

III B.Tech. I Semester Supplementary Examinations, November/December - 2012

ANTENNAS AND WAVE PROPAGATION

(Electronics and Communications Engineering)

Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry

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1. (a) Differentiate scattering loss aperture, collecting aperture & physical aperture of antenna.
   (b) In a microwave communication link, two identical antennas operating at 10 GHz are used with power gain of 40 dB. If the transmitter power is 1W. Find the received power, if the range of the link is 30Km.

2. (a) Explain loop antennas in detail
   (b) A grounded vertical antenna has an effective height of 113.3m and operates at a wavelength of 18.8 Km with a r.m.s. value of base current 725A. Find E and H fields at a distance of 175 Km and its power radiated.

3. (a) Briefly explain the following:
   1. Principle of pattern multiplication
   2. Binomial array

   (b) A linear broadside array consists of four equal isotropic inphase point sources with $\lambda/3$ spacing & overall length of the array is λ. Find the directivity & beam width.

4. (a) Explain different modes of operation of helical antenna in detail.
   (b) Find number of turns, turn diameter and axial ratio of right circularly polarized axial mode helical antenna with 17dB gain for operation at 1600MHz with turn spacing λ/π.

5. (a) Describe the constructional details and principles of operation of parabolic reflector. Discuss the relative merits and demerits of these antennas.
   (b) A paraboloid reflector antenna with diameter 20mts. It is designed to operate at 6GHz and illumination efficiency of 0.54. Calculate the antenna gain in decibels.

6. (a) With a neat sketch explain the different types of horn antennas. Mention merits and demerits of each type.
   (b) With the test antenna connected, the detector output meter is adjusted to read full scale or zero decibels. Now with the standard calibrated antenna connected, the output is down 7dB. If the gain of the calibrated antenna is 15dB, calculate the gain of the antenna under test.

7. (a) Write short notes on skip distance.
   (b) At a 150km height in the ionosphere, the electron density at night is about $2x10^{12}$ m^{-3} and the signal MUF is 1.5 times the critical frequency for a transmission distance of 600Km. Compute the following:
   (i) Critical frequency (ii) Relative dielectric constant (iii) Phase constant
   (iv) Wave impedance (v) Wave velocity (vi) Group velocity (vii) Incident angle

8. (a) Explain the following:
   1. Duct propagation
   2. Path losses

   (b) Two aircrafts are flying at altitudes of 3000m and 5000m respectively. What is the minimum possible distance along the surface of the earth over which they can have effective point to point microwave communication? Radius of earth is $6.37x10^{6}$m.

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Code No: : V3118 **R07** **Set No: 4**

III B.Tech. I Semester Supplementary Examinations, November/December - 2012

ANTENNAS AND WAVE PROPAGATION

(Electronics and Communications Engineering)

Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry

*****

1. (a) Explain the following terms:
   i. Antenna effective height
   ii. Antenna aperture
   iii. Current distribution on a thin wire antenna

   (b) The radiation resistance of an antenna is 72Ω and loss resistance is 8Ω. What is the directivity in dB if the power gain is 16.

2. (a) Obtain expression for potential fields due to sinusoidally varying sources and bring out the importance of Lorentz guage condition.

   (b) An Antenna whose effective height of 100m at a frequency of 60KHz radiated 100KW of power. Determine the strength of the electric field at a distance of 100Km from the antenna. Neglect ground effect and atmospheric losses.

3. (a) Discuss the conditions under which an array of antenna will behave either as a broadside array or an end fire array.

   (b) A broadside array operating at 100cm wavelength consists of four halfwave dipoles spaced 50cm. Each element carries radio frequency current in the same phase and of magnitude 0.5 amperes. Calculate
   (i) Radiated power
   (ii) Half width of the major lobe.

4. (a) Explain the following terms:
   i. Long wire antennas
   ii. V antennas

   (b) Design a five turn helical antenna which at 300MHz operates in the axial mode and possesses circular polarization in the major lobe. Determine the following:
   (i) Near optimum circumference (in λ and in meters)
   (ii) Spacing (in λ and in meters) for near optimum pitch angle design
   (iii) Input impedance (iv) Axial ratio

5. (a) Explain the following terms:
   i. Yagi-uda arrays
   ii. Corner reflectors
   (b) Calculate the angular aperture for a paraboloid reflector antenna for which the aperture number is
   (i) 0.25
   (ii) 0.50
   (iii) 0.60
   Given the diameter of the reflector mouth is 10m. Calculate the position of the focal point with reference to the reflector mouth in each case

6. (a) Explain the procedure for measuring the Directivity of antenna.
   (b) Calculate the minimum distance required to measure the field pattern of an antenna of diameter 2m at a frequency of 3GHz. Derive the necessary equations.

7. (a) Discuss the effects of earth's magnetic field on ionosphere radio wave propagation.
   (b) Communication by ionosphere propagation is required for a distance of 200Km. Height of the layer is 220Km and critical frequency is 5MHz. Find Maximum Usuable Frequency.

8. (a) Explain the Tropospheric wave propagation.
   (b) Determine the height of the transmitting antenna to obtain a maximum distance of transmission upto 38km from a 24 meter high receiving antenna.

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Code No: V3128 **R07** **Set No: 1**

III B.Tech. I Semester Supplementary Examinations, November/December - 2012

MICROPROCESSOR AND INTERFACEING

(Common to Computer Science and Engineering & Information Technology & Electronics and Computer Engineering)

Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

*****

1. (a) Draw and compare the flag register of 8085 and 8086 microprocessors.
   (b) Explain the physical address formation in 8086 microprocessor. [10+6]

2. (a) Write an assembly language program in 8086 to add two matrices of size 3x3.
   (b) Write an assembly language program in 8086 to find the largest in a series of 8-bit numbers. [8+8]

3. Draw the functional pin diagram of 8086 microprocessor and explain the functions of each pin. [16]

4. What are different operating modes of 8255? Explain each of them. Also discuss how to determine the control word for 8255. [16]

5. (a) What is an interrupt? What are the hardware and software interrupts of 8086? Explain the interrupt structure of 8086 microprocessor.
   (b) What is the purpose of IF flag in handling the interrupts. [10+6]

6. (a) Write a short note on RS232C standard.
   (b) With a neat block diagram, explain the architecture of 8251 USART. [6+10]

7. (a) What is meant by paging? Explain its advantages and disadvantages.
   (b) Explain the difference between the 80286 real address mode and PVAM. [8+8]

8. (a) What is a microcontroller? With a neat block diagram, explain the architecture of 8051 microcontroller.
   (b) Explain with suitable examples, the addressing modes used by 8051 to access internal data memory. [10+6]

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Code No: V3128 **R07** **Set No: 2**

III B.Tech. I Semester Supplementary Examinations, November/December - 2012

MICROPROCESSOR AND INTERFACEING

(Common to Computer Science and Engineering & Information Technology & Electronics and Computer Engineering)

Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

*****

1. (a) Explain the concept of segmented memory. What are its advantages?
   (b) List and explain the different assembler directives of 8086 microprocessor. [8+8]

2. (a) Write an assembly language program in 8086 to find out the LCM of two numbers.
   (b) Write an assembly language program in 8086 to add two numbers of 32-bits each. [8+8]

3. (a) Explain the maximum mode operation of 8086 microprocessor with corresponding read and write cycle timing diagrams.
   (b) What is meant by DMA? What is its need? Explain the DMA data transfer scheme. [10+6]

4. (a) Draw the architecture of 8255 and explain different modes of operation.
   (b) Write an assembly language program in 8086 to generate a saw tooth wave with 1KHz frequency? Give the necessary circuit set up with a DAC. [8+8]

5. (a) What is an interrupt? Which steps the 8086 follows to handle any interrupt? Also mention the priorities of interrupts in 8086.
   (b) Draw and explain the interrupt vector table of 8086 microprocessor. [8+8]

6. (a) Draw the block diagram of 8251 and explain each block.
   (b) Write an 8086 instruction sequence for receiving 100 characters using 8251 USART and store them in the memory. [8+8]

7. (a) Explain the procedure of converting linear address into physical address.
   (b) What are RISC processors? Differentiate between RISC and CISC processors. [8+8]

8. (a) Differentiate between microprocessors and microcontrollers.
   (b) What is an interrupt? Explain the interrupt structure of the 8051 microcontroller. [6+10]

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Code No: V3128 **R07** **Set No: 3**

III B.Tech. I Semester Supplementary Examinations, November/December - 2012

MICROPROCESSOR AND INTERFACEING

(Common to Computer Science and Engineering & Information Technology & Electronics and Computer Engineering)

Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

*****

1. Draw the register organization of 8086 and explain the typical applications of each register. [16]

2. (a) Write an assembly language program in 8086 to find out the square root of an 8-bit number.
   (b) Write an assembly language program in 8086 to find the factorial of the given number. [8+8]

3. (a) Explain the interfacing of static RAMs to 8086 with neat interface diagram.
   (b) What is DMA? Explain the need for DMA in Microprocessor based systems. [10+6]

4. (a) Write the control word register (CWR) format of 8255 for BSR mode and explain.
   (b) Sketch and explain the interface of PPI 8255 to the 8086 microprocessor. Interface 8 LEDs to the port B of 8255. Interface 8 keys to the port A. Write an assembly language program to read the key status and output on to the 8 LEds. [8+8]

5. What is the need for interrupt controller? Draw and explain the architecture of 8259 Programmable Interrupt Controller. [16]

6. (a) Discuss the serial data transmission standards and their specifications.
   (b) Draw and discuss the block diagram of 8251. [8+8]

7. (a) Explain in detail the 80286 memory management features and task switching.
   (b) Explain the descriptor table of 80386. [8+8]

8. Discuss various timer modes supported by the 8051 and write a program to initialize timer 0 in auto reload mode. [16]

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Code No: V3128 **R07** **Set No: 4**

III B.Tech. I Semester Supplementary Examinations, November/December - 2012

MICROPROCESSOR AND INTERFACEING

(Common to Computer Science and Engineering & Information Technology & Electronics and Computer Engineering)

Time: 3 Hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

*****

1. a) List and explain different string manipulation instructions of 8086 microprocessor.
   b) What is a macro? Explain with an example. [10+6]

2. (a) Write an assembly language program in 8086 to add two ASCII numbers.
   (b) Write an assembly language program in 8086 to display the string "Good Morning!" on the screen. [8+8]

3. What is the purpose of ALE, $\overline{BHE}$, $\overline{DT/R}$ and $\overline{DEN}$ pins of 8086? Show their timing in the system bus cycle of 8086. [16]

4. Interface a 12-bit DAC to 8255 with an address map of 0800H to 0803H. The DAC provides output in the range of +5V to -5V. Write the instruction sequence
   i. for generating a square wave with a peak to peak voltage of 2 V and the frequency will be selected from memory location "FREQ".
   ii. for generating a triangular wave with a maximum voltage of +5V and a minimum voltage of 0V. [16]

5. (a) What is the need for interrupt controller? Explain the features of programmable interrupt controller 5259A with its block diagram.
   (b) Describe the action taken by 8086 where INTR pin is activated. [10+6]

6. What do you mean by I/O mapped I/O? Draw and discuss the interfacing of 8251 with 8086 in I/O mapped I/O mode. [16]

7. (a) Write a note on virtual 8086 mode of 80386.
   (b) Explain the salient features of Pentium processor. Also explain the memory system of the Pentium processor. [8+8]

8. Draw and discuss the formats and bit definitions of the following SFRs
   i. TCON ii. PCON iii. TMOD iv. SCON [4+4+4+4]

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