

Code No: R31011

R10

Set No: 1

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

**DESIGN AND DRAWING OF CONCRETE STRUCTURES**

(Civil Engineering)

Time: 3 Hours

Max Marks: 75

Note: Answer any ONE question from PART-A and THREE question from PART-B  
Use of IS-456-2000 and design charts from SP-16 is allowed.

**PART-A**

1. A reinforced concrete beam is to be designed over an effective span of 5 m to support a design service live load of 8 kN/m. Adopt M20 grade concrete and Fe415 HYSD bars and design the beam to satisfy the limit states of collapse and serviceability. Sketch the details of reinforcement. [30]

OR

2. A simple supported floor slab 6.5 m × 3.0 m has to carry a half-brick partition wall of reinforced brickwork 3 m in height built along the full 3 meter span at the center of the slab in addition to an imposed characteristic load of 2.5 kN/m<sup>2</sup>. Design the floor slab assuming  $f_y = 415 \text{ N/mm}^2$ , and  $f_{ck} = 20 \text{ N/mm}^2$ . Sketch the details of reinforcement. [30]

**PART-B**

3. A rectangular section of a simply supported beam is 250 × 420 mm in section with effective cover of 40 mm to the center of reinforcement. It has 4 Nos. of 12 mm bars continued to the supports. Find the shear capacity at the support if the shear reinforcement consists of double vertical stirrup of 8 mm diameter at 200 mm spacing. Assume  $f_y = 250 \text{ N/mm}^2$ , and  $f_{ck} = 20 \text{ N/mm}^2$ . [15]
4. Design the reinforcements in a circular reinforced concrete column of diameter 350 mm with helical ties to support a factored axial load of 1600 kN. The column has an unsupported length of 3.5 m and is braced against side sway. Adopt M25 grade concrete and Fe500 grade reinforcement. [15]
5. A square footing 3.5 m × 3.5 m is used for a square column 300 × 300 mm carrying a total ultimate load of 1500 kN. Safe bearing capacity of the soil is 100 kN/m<sup>2</sup>. Using grade 20 concrete and Fe415 steel, design the footing as sloped footing. [15]
6. Design a cantilever staircase consisting of independent steps cantilevering out of the wall. The width of steps is 1.0 m with rise and tread of 175 mm and 250 mm, respectively. The staircase is to support a superimposed load of 3.0 kN/m<sup>2</sup>. Use M20 grade concrete and HYSD steel of grade Fe415 as reinforcement. [15]
7. (a) Explain with derivation how span/depth ratio can be used to control deflection in beams.  
(b) What are high bond bars? Why is it necessary to specify projections on bars made from FE415 and Fe500 steel, whereas such projections are not obligatory for Fe250 steel?  
(c) Why is the partial safety factor for concrete ( $\gamma_c$ ) greater than that for reinforcing steel ( $\gamma_s$ ) in the consideration of ultimate limit states? [5 + 5 + 5]

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Set No: 2

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**DESIGN AND DRAWING OF CONCRETE STRUCTURES**

(Civil Engineering)

**Time: 3 Hours**

**Max Marks: 75**

**Note: Answer any ONE question from PART-A and THREE question from PART-B  
Use of IS-456-2000 and design charts from SP-16 is allowed.**

**PART-A**

1. Design a reinforced concrete continuous beam of rectangular section to support a dead load of 8 kN/m and service live load of 15 kN/m over 4 spans of 8 m each. Assume the ends as simply supported. Adopt M20 grade concrete and Fe415 HYSD bars. Sketch the details of reinforcements in the continuous beam. [30]

OR

2. A room is 3.0 m × 4.5 m, and the walls are built with 250 mm brick work. It is covered with a simply supported slab which has to take an imposed characteristic load of 2.0 kN/m<sup>2</sup>. Design the slab and sketch the layout of the reinforcements. Explain whether this slab needs any corner steel as reinforcement. Assume  $f_y = 415 \text{ N/mm}^2$ , and  $f_{ck} = 15 \text{ N/mm}^2$ . [30]

**PART-B**

3. A reinforced concrete simply supported beam is 300 × 500 mm in section. It has an effective span of 6 m and cover to center of the main steel is 50 mm. It is reinforced at the center of the beams with 5 Nos. of 20 mm mild steel bars of which 2 Nos. are curtailed at 0.15L from the supports. Mild steel bars are to be used as shear steel also. If the shear force at the supports due to the uniformly distributed characteristic load is 100 kN, design the shear reinforcement. Assume that grade 25 concrete is used for the beam. [15]
4. Design a short circular column of diameter 350 mm to support a factored axial load of 1000 kN, together with a factored moment of 100 kNm. Adopt M20 grade concrete and Fe415 HYSD bars. [15]
5. Design a pad footing (constant depth) for a rectangular column 300 × 450 mm carrying an axial factored load of 1500 kN. The safe bearing capacity of the soil is 120 kN/m<sup>2</sup>. Use M20 concrete and grade 415 steel. [15]
6. Design a flight between landing to landing of a tread-riser type of staircase, with 10 risers, each 150 mm, and with tread of 270 mm. The upper and lower landings are 1200 mm wide each supported on 230 mm thick masonry walls at the edges, parallel to the risers. The risers are liable to be overcrowding. The materials to be used for construction are M20 grade concrete and HYSD bars of grade Fe415. [15]
7. (a) What methods are available in IS code for control of crack width in RC members? Are the methods and formulae for calculation for crack width given in IS code?  
(b) Explain the terms average bond stress and local bond stress. Derive expressions for these.  
(c) Why is it that the partial safety factor for concrete ( $\gamma_c$ ) is applicable at all stress levels whereas that for reinforcing steel ( $\gamma_s$ ) is applicable only near the “yield stress” level? [5 + 5 + 5]

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Code No: R31011

R10

Set No: 3

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

**DESIGN AND DRAWING OF CONCRETE STRUCTURES**

(Civil Engineering)

**Time: 3 Hours**

**Max Marks: 75**

**Note: Answer any ONE question from PART-A and THREE question from PART-B  
Use of IS-456-2000 and design charts from SP-16 is allowed.**

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**PART-A**

1. Design a rectangular reinforced concrete beam to resist service moments of 120 kNm from dead loads and 110 kNm from live loads. The beam dimensions should be 250 × 625 mm and cover 25 mm with 10 mm stirrups.  $f_y = 250 \text{ N/mm}^2$ , and  $f_{ck} = 15 \text{ N/mm}^2$ . Sketch the details of reinforcement. [30]

OR

2. A framed building (slabs on beams and columns) with columns spaced at 4 m in the North-South direction and columns spaced at 5 m in the East-West direction has RCC slabs over the beams. The slab has to carry a characteristic live load of  $3 \text{ kN/m}^2$  in addition to a floor finish of  $1 \text{ kN/m}^2$ , and the dead load. Using concrete of grade 20 and Fe415 steel design a suitable corner slab. Sketch the details of the main and corner steel reinforcement. [30]

**PART-B**

3. A beam of rectangular section is reinforced with 6 Nos. 18 mm diameter bars in tension and is supported on an effective span of 5 m, the beam being 300 mm wide and 700 mm depth. The beam carries a uniformly distributed load of 42 kN/m. If  $\sigma_{sv} = 230 \text{ N/mm}^2$ ,  $\tau_c = 0.30 \text{ N/mm}^2$  and  $f_y = 415 \text{ N/mm}^2$ , design the shear reinforcement considering no bars are bent up for shear. At what distance from support can 2 Nos. 18 mm bars be bent up. Obtain web reinforcement with bars bent up. Take  $j = 0.902$ . [15]
4. A concrete column 500 × 700 mm is of effective height 6 m and is provided with 6 Nos. of 25 mm bars as longitudinal steel. Determine its ultimate bending moment capacity about the major axis when it will be subjected to an ultimate axial load of 2.5 MN. Assume  $f_y = 415 \text{ N/mm}^2$ , and  $f_{ck} = 25 \text{ N/mm}^2$ , and clear cover according to IS 456 for normal conditions of exposure. Place the steel for maximum moment capacity about major axis. [15]
5. Design a combined footing for the two columns of a multistorey building. The columns of size 400 × 400 mm transmits a working load of 800 kN each and they are spaced at 5 m centers. The safe bearing capacity of soil at the site is  $200 \text{ kN/m}^2$ . Adopt M20 grade concrete and Fe415 grade reinforcement. [15]



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6. Design a single flight straight stairs in a residential building for the movement from the ground at the roof at a height of 3.3 m. The stairs are built in the wall with a bearing of 120 mm along the flight and support a superimposed load of  $3.0 \text{ kN/m}^2$ . The weight of finishes is  $0.30 \text{ kN/m}^2$  of finished step surface. The rise and tread of the step are 175 mm and 250 mm, respectively. The width of the stairs is 1.00 m. The materials of construction are M20 grade concrete and Fe415 grade steel. [15]
7. (a) When will one provide side reinforcement in beams? What are the specifications regarding its position?  
(b) If the theoretical steel needed is  $A_s$  and if much more steel than necessary has been provided, can the development length for the bars be of reduced value than the theoretical? Justify your answer.  
(c) How does the stress strain curve of concrete vary with various types of loading? Sketch a typical stress strain curve of concrete and indicate the various moduli.

[5 + 5 + 5]

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Code No: R31011

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Set No: 4

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

**DESIGN AND DRAWING OF CONCRETE STRUCTURES**

(Civil Engineering)

**Time: 3 Hours**

**Max Marks: 75**

**Note: Answer any ONE question from PART-A and THREE question from PART-B  
Use of IS-456-2000 and design charts from SP-16 is allowed.**

**PART-A**

1. An L beam has the flange width of 900 mm, with the thickness of slab 100 mm. The web below is 250 × 500 mm. Determine the areas of steel required for it to carry a limiting moment of 600 kNm. Assume  $f_{ck} = 15 \text{ N/mm}^2$  and grade 415 steel. Sketch the details of reinforcement. [30]

OR

2. Design a simply supported slab to cover a hall with internal dimensions 4.0 m × 6.0 m. The slab is supported on masonry walls 230 mm thick. Assume a live load of 3 kN/m<sup>2</sup> and finish load of 1 kN/m<sup>2</sup>. Use M20 concrete and Fe415 steel. Assume that the slab corners are prevented from lifting up. [30]

**PART-B**

3. A reinforced concrete beam 500 mm wide and 1060 mm effective depth carries a load of 10 kN/m, inclusive of its own weight on a simply supported span of 10 m. The beam is reinforced with 12 Nos. 20 mm diameter bars in two layers with 8 Nos. at bottom and 4 Nos. above that. Find the distance from the center of beams where bars can be bent up in pair, total Nos. of bars to be curtailed being 6 Nos. Suggest the arrangement of bars and design vertical stirrups for shear as necessary. Assume  $\sigma_{sv} = \sigma_{st} = 230 \text{ N/mm}^2$ ,  $\tau_c = 0.32 \text{ N/mm}^2$ ,  $\tau_{bd} = 0.60 \text{ N/mm}^2$  and  $f_y = 415 \text{ N/mm}^2$ . [15]
4. A short column 250 square has to carry an ultimate axial load of 600 kN along with ultimate moments of 60 kNm about one axis and 40 kNm about the other axis. Assuming  $f_y = 415 \text{ N/mm}^2$ , and  $f_{ck} = 30 \text{ N/mm}^2$  and cover to be the minimum as per IS 456; design the longitudinal steel. [15]
5. Design a trapezoidal footing for the two columns A and B transmitting service loads of 800 kN and 1600 kN respectively. The column A is 400 mm square and column B is 600 mm square in size and they are spaced at 5 m centers. The property line is 300 mm beyond the face of column A. The safe bearing capacity of soil at site is 150 kN/m<sup>2</sup>. Adopt M20 grade concrete and Fe415 HYSD bars. [15]
6. A staircase of 1.2 m width for an office building consists of each step built into the wall with a bearing of 110 mm along the flight with the tread = 250 mm and rise = 200 mm. Design the staircase, assuming  $f_y = 415 \text{ N/mm}^2$ , and  $f_{ck} = 15 \text{ N/mm}^2$ . [15]
7. (a) What broad practical rules would you use in choosing a depth for an RCC beam?  
(b) Obtain expression for calculation of bond stress and shear stress in case of reinforced concrete beams of rectangular section with tensile steel of diameter  $\phi$ . Also obtain relationship between bond stress and shear stress.  
(c) Explain the basis for the selection of partial safety factors (for loads and materials) by IS code for "Serviceability limit states"? [5 + 5 + 5]

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Code No: R31021

R10

Set No: 1

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

**COMPLEX VARIABLES AND STATISTICAL METHODS**

(Electrical and Electronic Engineering)

Time: 3 Hours

Max Marks: 75

Answer any FIVE Questions  
All Questions carry equal marks

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- (a) Show that  $f(z) = |z|^2$  is not analytic.  
(b) Find the analytic function  $f(z) = u(r, \theta) + iv(r, \theta)$  such that

$$v(r, \theta) = \left(r - \frac{1}{r}\right) \sin \theta, \neq 0$$

- (a) State and Prove Cauchy's integral theorem?  
(b) Evaluate  $\int \frac{z e^z dz}{(z+2)^3}$  where  $c$  is  $|z|=3$  using Cauchy's integral formula?

- (a) Find the poles and residues at each pole of  $f(z) = \frac{\sin^2 z}{(z - \pi/6)^2}$

(b) Evaluate the following by contour applying the calculus of residues.  $\int_0^{2\pi} \frac{d\theta}{5 - 3 \cos \theta}$

- (a) Find the image of the circle  $|z| = 2$ , under the transformation  $w = z + 3 + 2i$ .  
(b) Prove that under the transformation  $w = \frac{1}{z}$ , the image of the lines  $y=x-1$  and  $y=0$  are the circle  $u^2 + v^2 - u - v = 0$  and the line  $v=0$  respectively.

- (a) A can hit a target 3 times in 5 shots, B hits target 2 times in 5 shots, C hits target 3 times in 4 shots. Find the probability of the target being hit when all of them try.  
(b) Fit a Poisson distribution for the following data and calculate the expected frequencies

X	0	1	2	3	4
F(x)	109	65	22	3	1

- (a) The mean life time of light bulbs produced by company is 1500 hours and S,D of 150 hours. Find the probability that lighting will take place for (a) at least 5000 h. (b) at most 4200h if three bulbs are connected such that when one bulb burns out, another bulb will go on. Assume that life times are normally distributed.  
(b) Write a short note on interval estimation and Bayesian estimation.'



7. (a) A sample of 400 items is taken from a population whose standard deviation is 10. The mean of the sample is 40. Test whether the sample has come from a population with mean 38. Also calculate 95% confidence interval for the population.
- (b) In a sample of 600 students of a certain college 400 are found to use ball pens. In another college, from a sample of 900 students 450 were found to use ball pens. Test whether the two colleges are significantly different with respect to the habit of using ball pens.
8. (a) The heights of 10 males of a given locality are found to be 70, 67, 62, 61, 68, 70, 64, 66 inches. Is it reasonable to believe that the average height is greater than 64 inches? Test at 5% significance level assuming that for 9 degrees of freedom ( $t = 1.833$  at  $\alpha = 0.05$ ).
- (b) The nicotine contents in milligrams in two samples of tobacco were found to be as follows.

Sample A	24	27	26	21	25	
Sample B	27	30	28	31	22	36

Can it be said that the two samples have come from the same normal population?

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**COMPLEX VARIABLES AND STATISTICAL METHODS**

(Electrical and Electronic Engineering)

Time: 3 Hours

Max Marks: 75

Answer any FIVE Questions  
All Questions carry equal marks

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1. (a) Show that  $f(z) = \cos z$  is analytic everywhere in the complex plane and find  $f'(z)$ .  
(b) If  $f(z) = u + iv + \frac{1}{z}$ , show that the curves  $u(x, y) = c_1$  and  $v(x, y) = c_2$  intersect orthogonally.

2. State and Prove Cauchy's Integral formula. Find  $f(2)$  and  $f(3)$  if  $f(a) = \int_c \frac{(2z^2 - z - 2) dz}{z - a}$  where  $c$  is the circle  $|z| = 2.5$  using Cauchy's integral formula.

3. (a) Find the poles and residues at each pole of  $\frac{2z + 1}{1 - z^4}$   
(b) Evaluate the following by contour applying the calculus of residues.

$$\int_0^{2\pi} \frac{d\theta}{1 - 2p \sin \theta + p^2}$$

4. (a) Find the image of the rectangle  $R: -\pi < x < \pi, \frac{1}{2} < y < 1$  under the transformation  $w = \sin z$ .  
(b) Find the angle of rotation at the point  $z = z + 1$  when the transformation is  $w = z^2$ . Also find  $r$  of the transformation at that point.
5. (a) Companies  $B_1, B_2, B_3$  produce 30%, 45% and 25% of the cars respectively. It is known that 2%, 3% and 2% of the cars produced from  $B_1, B_2,$  and  $B_3$  are defective. If a car purchased is found to be defective what is the probability that this car is produced by company  $B_3$ ?  
(b) Fit a normal distribution to the following distribution:

Class	5-9	10-14	15-19	20-24	25-29	30-34	35-39
F	1	10	37	36	13	2	1



6. (a) A normal population has a mean of 0.1 and standard deviation of 2.1. Find the probability that men of sample of size 900 will be negative.  
 (b) Using the mean of a random sample of size 150 to estimate the mean mechanical aptitude of mechanics of a large workshop and assuming  $\sigma = 6.2$  what can we assert with 0.99 probability about the maximum size of the error.
7. (a) The mean life of a sample of 10 electric bulbs was found to be 1456 hours with S.D. of 423 hours. A second sample of 17 bulbs chosen from a different batch showed a mean life of 1280 hours with S.D. of 398 hours. Is there a significant difference between the means of two batches?  
 (b) In a city 250 men out of 750 were found to be smokers. Does this information support the conclusion that the majority of men in this city are smokers?
8. (a) The heights of 10 males of a given locality are found to be 70, 67, 62, 61, 68, 70, 64, 66 inches. Is it reasonable to believe that the average height is greater than 64 inches? Test at 5% significance level assuming that for 9 degrees of freedom ( $t = 1.833$  at  $\alpha = 0.05$ ).  
 (b) The following table gives the number of units of production per day turned out by four different types of machines.

Employee	Type of Machines			
	M1	M2	M3	M4
E1	43	39	9	35
E2	41	44	53	45
E3	39	34	52	38
E4	49	51	56	48

Using ANOVA

- (i) Test the hypothesis that the mean production is the same for the four machines.  
 (ii) Test the hypothesis that the employees do not differ with respect to mean productivity

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

**COMPLEX VARIABLES AND STATISTICAL METHODS**

(Electrical and Electronic Engineering)

Time: 3 Hours

Max Marks: 75

Answer any FIVE Questions  
All Questions carry equal marks

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- (a) Show that the function  $u = \frac{1}{2} \log(x^2 + y^2)$  is harmonic and find its conjugate.

(b) Find the regular function whose imaginary part is  $e^{-x}(x \cos y + y \sin y)$
- (a) Evaluate  $\int_c \frac{e^{3z} dz}{(z^3 - 4z)}$  where  $c$  is  $|z+2|=3/2$  using Cauchy's integral formula.

(b) Expand the Laurent series of  $\frac{z^2 - 1}{(z+2)(z+3)}$ , for  $|z| > 3$ .
- (a) Find the poles and residues at each pole of  $\tan hz$

(b) Evaluate the following by contour applying the calculus of residues.

$$\int_0^{2\pi} \frac{\cos 3\theta}{5 - 3 \cos \theta} d\theta$$
- (a) Show that the transformation  $w = \frac{1}{z}$  maps a circle to a circle or to a straight line if the former goes through the origin.

(b) Prove that under the transformation  $w = \frac{1}{z}$ , the image of the lines  $y=x-1$  and  $y=0$  are the circle  $u^2 + v^2 - u - v = 0$  and the line  $v=0$  respectively
- (a) The probabilities that students A, B, C, D solve a problem are  $\frac{1}{3}, \frac{2}{5}, \frac{1}{5}$ , and  $\frac{1}{4}$  respectively. If all of them try to solve the problem, what is the probability that the problem is solved.

(b) Fit a Poisson distribution for the following data and calculate the expected frequencies

X	0	1	2	3	4
F(x)	109	65	22	3	1



6. (a) A random sample of size 100 is taken from a population with  $\sigma = 5.1$ . Given that the sample mean is  $\bar{x} = 21.6$  construct a 95% confidence interval for the population mean  $\mu$ .  
 (b) Construct a 99% confidence interval for the true mean weight loss if 16 persons on diet control after one month had a mean weight loss of 3.42 kgs with S.d of 0.68 kgs.
7. (a) A coin was tossed 400 times and returned heads 216 times. Test the hypothesis that the coin is unbiased. Use a 0.05 Level of significance.  
 (b) In two large populations, there are 30%, and 25% respectively of fair haired people. Is this difference likely to be hidden in samples of 1200 and 900 respectively from the two populations?
8. (a) Memory capacity of 10 students were tested before and after training. State whether the training was effective or not from the following scores.

Before training	12	14	11	8	7	10	3	0	5	6
After training	15	16	10	7	5	12	10	2	3	8

- (b) The following table gives the number of refrigerators sold by 4 salesmen of Kelvinator (India) Ltd, in three months: May, June, July

Month	A	B	C	D
May	50	40	48	39
June	46	48	50	45
July	39	44	40	39

- Using ANOVA, test the hypothesis that mean sales is the same for three months. (or is there a significant difference in the sales made by the four salesmen ?)

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**COMPLEX VARIABLES AND STATISTICAL METHODS**

(Electrical and Electronic Engineering)

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

Answer any FIVE Questions  
All Questions carry equal marks

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1. (a) Show that the function  $e^z (z \cos y + i \sin y)$  is holomorphic (analytic) and find its derivative.

(b) Determine the analytic function whose real part is  $e^{2x} (x \cos 2y - y \sin 2y)$

2. (a) Evaluate  $\int_C \frac{e^z \sin 2z - 1}{z^2 (z+2)^2} dz$  where C is  $|z| = \frac{1}{2}$  using Cauchy's integral formula

(b) Find the Laurent series of the function  $f(z) = \frac{z}{(z+1)(z+2)}$  about  $z = -2$

3. (a) Find the residue of

$$f(z) = \frac{z^3}{(z-1)^4 (z-2)(z-3)} \text{ at } z = 1$$

(b) Use method of contour integration to evaluate  $\int_{-\infty}^{\infty} \frac{x^2}{(x^2+a^2)^3} dx$

4. (a) Show that the function  $w = \frac{4}{z}$  transforms the straight line  $x=c$  in the  $z$ -plane into a circle in the  $w$ -plane.

(b) Find the bilinear transformation which maps the points  $(-1, 0, 1)$  into the points  $(0, i, 3i)$ .

5. (a) A, B, C, are aiming to shoot a balloon. A will succeed 4 times out of 5 attempts. The chance of B to shoot the balloon is 3 out of 4 and that C is 2 out of 3. If the three aim the balloon simultaneously, then find the probability that at least two of them hit the balloon.

(b) Fit a poisson distribution for the following data and calculate the expected frequencies

X	0	1	2	3	4	5	6	7	8
F	56	156	132	92	37	22	4	0	1



6. (a) Determine the probability that the sample mean area. Covered by the sample of 40 of 1 liter paint boxes will be between 510 and 520 square feet, given that a 1 liter of such paint box covers on the average 513.3 square feet with S.D of 31.5 sft.  
 (b) In how many ways the estimation can be done and what are they? Explain in detail.
7. (a) A die was thrown 9000 times and of these 3220 yielded a 3 or 4 .Is this consistent with the hypothesis that the die was unbiased? (Use  $\alpha=0.01$ ) as level of significance)  
 (b) Write short notes on Type – I and Type-II errors
8. (a) To compare two kinds of bumper guards.6 of each kind were mounted on a car and then the car was run into a concrete wall .T he following are the costs of repairs

Guard 1	107	148	123	165	102	119
Guard 2	134	115	112	151	133	129

- (b) Three samples, each of size 5, were drawn from three uncorrelated normal populations with equal variances. Test the hypothesis that the population means are equal at 5% level.

Sample 1	10	12	9	16	13
Sample 2	9	7	12	11	11
Sample 3	14	11	15	14	16

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

**FINITE ELEMENT METHODS**

(Common to Mechanical Engineering & Auto Mobile Engineering)

**Time: 3 Hours**

**Max Marks: 75**

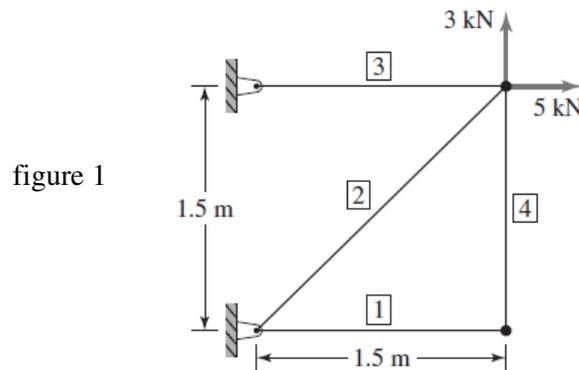
Answer any FIVE Questions

All Questions carry equal marks

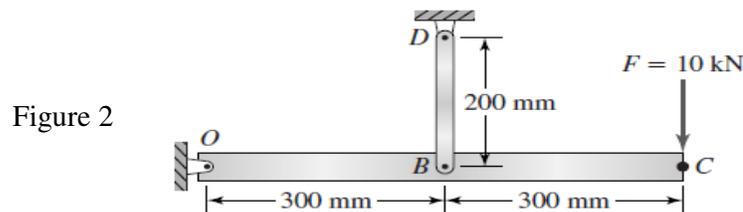
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- Explain the difference between the plane stress and plane strain condition.
  - Derive the element stiffness matrix for one dimensional element.
- Explain node numbering scheme. What is its significance?
  - Explain the discretisation process with an example.
- The plane truss shown in figure 1 is composed of members having a square  $15 \text{ mm} \times 15 \text{ mm}$  cross section and modulus of elasticity  $E = 69 \text{ GPa}$ .

  - Assemble the global stiffness matrix.
  - Compute the nodal displacements in the global coordinate system for the loads shown.



- Determine the deflection of point C in figure 2. The modulus of elasticity of the beam OBC is  $207 \text{ GPa}$  and the dimensions of the cross section are  $40 \text{ mm} \times 40 \text{ mm}$ . For the elastic rod BD, the modulus of elasticity is  $60 \text{ GPa}$  and the cross sectional area is  $78.54 \text{ mm}^2$ . Also find the support reactions and stress within the each element.



5. (a) Derive the expression for consistent load vector due to self-weight in a Constant Strain Triangle element.  
(b) The vertices of a Constant Strain Triangle element are given by (3, 2), (7, 9) and (12, 5). Determine the Shape functions and strain - nodal displacement matrix, B.
6. (a) Use Gaussian quadrature to obtain an exact value for the integral  $I = \int_{-1}^1 \int_{-1}^1 (r^3 - 1)(s - 1)^2 dr ds$   
(b) The vertices of a four noded quadrilateral element is given by A (0, 0), B (20, 0), C (20, 10) and D (0, 10). All the dimensions are in mm. Determine the Jacobian and strain displacement relation at a point P (15, 8).
7. (a) Explain the different boundary conditions that can be applied to a one dimensional heat transfer problem  
(b) A metallic fin which is 1mm thick and 600 mm long extends from plane wall whose temperature is 300 °C. Determine the temperature distribution from the fin to the air at 20 °C with  $h = 9 \text{ W/m}^2 \text{ } ^\circ\text{C}$ . Take the thermal conductivity of the fin,  $k = 20 \text{ W/m } ^\circ\text{C}$ . Width of the fin is 100 mm.
8. (a) Differentiate between the consistent mass matrix and lumped mass matrix.  
(b) A uniform cantilever beam of length L, Young's modulus E and density  $\rho$  is modelled by a single element. Calculate frequencies and modes by consistent mass matrix.

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

**FINITE ELEMENT METHODS**

(Common to Mechanical Engineering & Auto Mobile Engineering)

**Time: 3 Hours**

**Max Marks: 75**

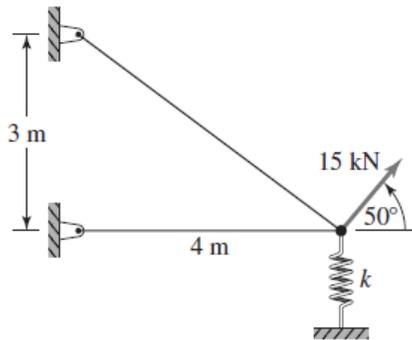
Answer any FIVE Questions

All Questions carry equal marks

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- Find the approximate solution to the following boundary value problem by using Galerkin method. Compare the solution with the exact solution.  $\frac{d^2u}{dx^2} = x$   $0 < x < 1$ ;  $u(0) = 0$  and  $u(1) = 0$
- (a) Define the shape function. What are the properties of a shape functions?  
(b) Explain elimination method for boundary conditions.
- Figure 1 shows a two-member plane truss supported by a linearly elastic spring. The truss members are of a solid circular cross section having  $d = 20$  mm and  $E = 80$  GPa. The linear spring has stiffness constant  $50$  N/mm. Assemble the system global stiffness matrix and calculate the global displacements of the unconstrained node.

Figure 1

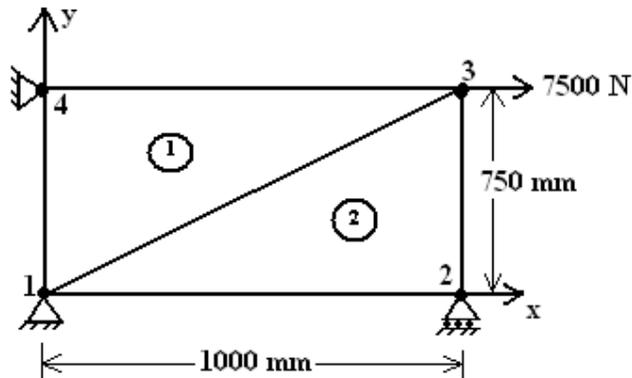


- (a) What are the nodal variables associated with a 2 noded flexural element?  
(b) Derive the interpolation functions that describe the distribution of displacement in terms of the nodal variables for a 2 noded flexural element. Present these interpolation functions graphically.  
(c) Develop the expression for the normal stress using the above interpolation functions.



5. Determine the nodal displacement and element stresses for the thin plate shown in figure 2. Body force is neglected. Take, Thickness ( $t$ ) = 10mm, Young's modulus ( $E$ ) =  $2 \times 10^5$  N/mm<sup>2</sup>, Poisson's ratio ( $\nu$ ) = 0.25. Assume plane stress condition.

Figure 2



6. A four noded quadrilateral element is defined by the vertices A (0, 0), B (2, 0), C (2, 1) and D (0, 1) in counter clockwise. Evaluate the Jacobian matrix and its determinant for all the 2 X 2 Gauss quadrature points.
7. Using Galerkin approach, derive the stiffness matrix for a torsional triangular element. Explain the procedure of evaluating shear stress component.
8. A simply supported beam of span length 800 mm is having a rectangular cross section 75 mm X 25 mm. Young's modulus  $E$  and density  $\rho$  of the material are given by 200 GPa and 7850 kg/m<sup>3</sup>. Evaluate eigenvalues and eigenvectors of the beam using two element model.

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

**FINITE ELEMENT METHODS**

(Common to Mechanical Engineering & Auto Mobile Engineering)

**Time: 3 Hours**

**Max Marks: 75**

Answer any FIVE Questions  
All Questions carry equal marks

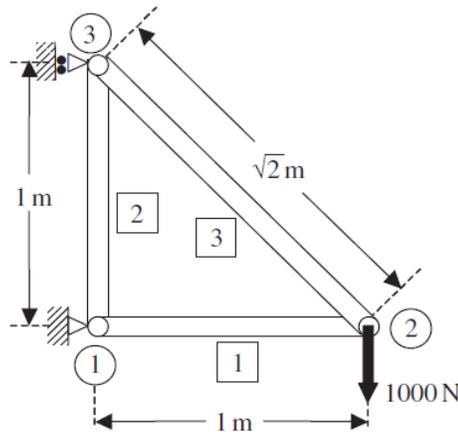
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- The functional form of a bar clamped at one end and left free at the other end and subjected to uniform axial load  $q$  is given by  $I = \int_0^L \left[ \frac{1}{2} AE \left( \frac{du}{dx} \right)^2 - qu \right] dx$

The essential boundary is  $u(0) = 0$ , obtain the approximate solution to the problem by using Rayleigh-Ritz method.

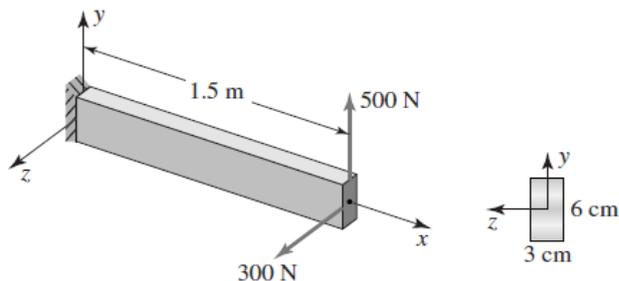
- Derive the element stiffness matrix, force vector for a two noded axial element using potential energy approach and the natural coordinate system for shape functions. Assume constant body force and traction.
  - Compare the elimination and the penalty approach in imposing the essential boundary conditions.
- The plane truss shown in Figure 1 is composed of members having  $0.1 \text{ m}^2$  cross section area and modulus of elasticity  $E = 70 \text{ GPa}$ . (a) Assemble the global stiffness matrix.(b) Compute the nodal displacements in the global coordinate system.

Figure 1



- The cantilevered beam depicted in Figure 2 is subjected to two-plane bending. The loads are applied such that the planes of bending correspond to the principal moments of inertia. Model the beam as a single element and compute the deflections of the free end, node 2. Determine the exact location and magnitude of the maximum bending stress. (Use  $E = 207 \text{ GPa}$ .)

Figure 2



5. Derive the shape functions for a CST element using natural coordinate system. Verify the properties of the shape functions. Using these shape functions establish strain-displacement relationship for CST element.
6. (a) Use Gaussian quadrature to obtain exact values for the following integrals. Verify exactness by analytical integration.  $\int_1^6 (y^3 + 2y)dy$
- (b) For a four noded quadrilateral element derive the relationship between the gradients of the field variable in the global coordinate system to the natural coordinate system.
7. (a) A three noded element is defined by the vertices A (1, 1), B (10, 4) and C (6, 7) in counter clockwise. The temperatures at these nodes are given by 120 °C, 140 °C and 80 °C respectively. Assuming a linear distribution, determine the temperature at point P (7, 4).
8. (a) Derive the consistent mass matrix for a linear triangle element.  
(b) What are the properties of the eigenvectors? Explain the evaluation of the eigen vectors by any one method.

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

**FINITE ELEMENT METHODS**

(Common to Mechanical Engineering &amp; Auto Mobile Engineering)

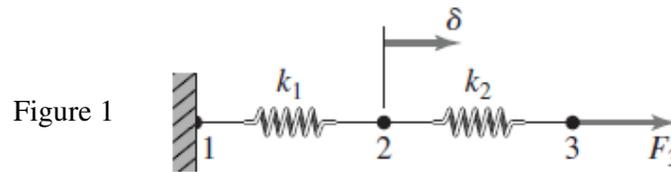
**Time: 3 Hours****Max Marks: 75**

Answer any FIVE Questions

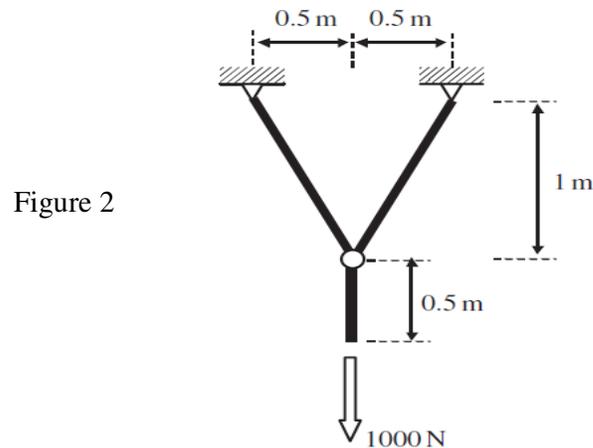
All Questions carry equal marks

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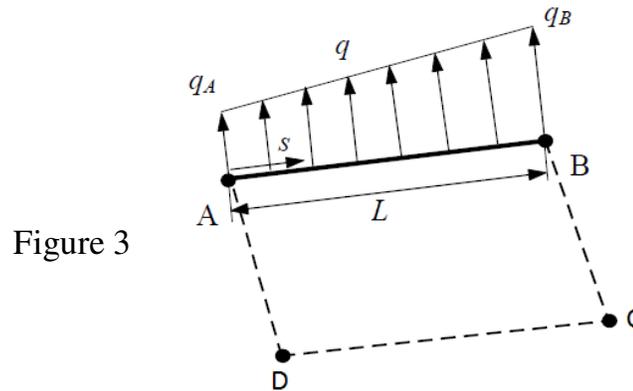
1. Explain the principle of minimum potential energy. Use this principle to determine the force  $F_3$  required for the displacement of  $\delta$  for the spring system in figure 1



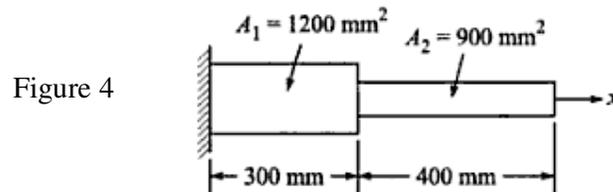
2. (a) What are the convergence requirements that an interpolation polynomial must satisfy?  
 (b) Explain different mesh generation techniques.
3. The plane truss shown in Figure 2 is composed of members having  $0.01 \text{ m}^2$  cross section area and modulus of elasticity  $E = 70 \text{ GPa}$ .  
 (a) Assemble the global stiffness matrix.  
 (b) Compute the nodal displacements in the global coordinate system  
 (c) Compute the axial stress in each element



4. (a) Derive the stiffness matrix for 2-noded flexural element using minimum potential approach. Use Hermite shape functions in dimensionless length coordinate.  
 (b) Present the work equivalent nodal force and moments for uniform distributed load on 2-noded flexural element.
5. A long hollow cylinder of inside diameter 100 mm and outside diameter 140 mm is subjected to an internal pressure of  $4\text{N/mm}^2$ . By using two elements on the 15mm length, calculate the displacements at the inner radius. Young's Modulus is 200 GPa and Poisson's Ratio = 0.3.
6. (a) Differentiate between Sub-parametric, Iso-parametric and Super-parametric elements with examples.  
 (b) The traction on a four noded element ABCD is as shown in Figure 3. Derive the equivalent nodal force vector.



7. (a) Determine the temperature distribution in a plane wall of thickness 60 mm, which has an internal heat source of  $0.3\text{ MW/m}^3$  and the thermal conductivity of the material is  $21\text{ W/m}^\circ\text{C}$ . Assume that the surface temperature of the wall is  $40^\circ\text{C}$ . Let the cross-sectional area for heat flow,  $A = 1\text{ m}^2$ .  
 (b) What are the forced and natural boundary conditions in the Heat Transfer analysis?
8. Consider axial vibration of the steel bar as shown in Figure 4. Develop the global stiffness and mass matrix. Determine the natural frequency and mode shapes.



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Code No: R31041

R10

Set No: 1

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

**COMPUTER ARCHITECTURE & ORGANIZATION**

(Electronics and Communication Engineering & Electronics and Instrumentation Engineering)

**Time: 3 Hours**

**Max Marks: 75**

Answer any FIVE Questions  
All Questions carry equal marks

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- 1 Perform the arithmetic operations:
  - a.  $(+52) + (-13)$
  - b.  $(-52) - (-13)$
  - c.  $(-24) + (14)$
  - d.  $(24) + (14)$  using 2's complement method.
  
- 2
  - a) Explain the most common fields found in instruction formats. Take one arithmetic equation and evaluate the arithmetic equation using zero, one, two or three address instructions.
  - b) List various registers in a computer along with their purpose.
  
- 3
  - a) What are the design goals for a designer while deciding a hardwired or micro programmed CU for a CPU.
  - b) Write short notes on micro instruction sequencing.
  
- 4
  - a) Explain Booth multiplication algorithm.
  - b) Multiply  $3 \times (-7)$  using Booth multiplication algorithm.
  
- 5
  - a) Give at least four differences between a magnetic-drum and a magnetic-tape unit.
  - b) Describe in words and by means of a block diagram how multiple matched words can be read out from an associative memory.
  
- 6
  - a) Discuss daisy-chain priority interrupt.
  - b) Draw a flow chart that describes the sequence of operations in the transmitter portion of an asynchronous communication interface.
  
- 7
  - a) List and explain the advantages of multi processors.
  - b) Write a short note on cache coherence.
  
- 8
  - a) Write a short note on array processors.
  - b) Differentiate tightly coupled and loosely coupled microprocessors.

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Code No: R31041

R10

Set No: 2

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

**COMPUTER ARCHITECTURE & ORGANIZATION**

(Electronics and Communication Engineering & Electronics and Instrumentation Engineering)

**Time: 3 Hours**

**Max Marks: 75**

Answer any FIVE Questions  
All Questions carry equal marks

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- 1 a) Draw the block diagram of a computer system and explain each of its parts along with their functions.  
b) Explain about floating-point representation with example.
- 2 Define instruction cycle. Explain the fetch and decode cycles for a register transfer statements show how the register transfer statements are implemented in the bus system. Draw the flowchart for instruction cycle.
- 3 a) Define the following:
  - i. Micro operation
  - ii. Micro instruction
  - iii. Micro program
  - iv. Control memory.b) Explain the selection of address for control memory?
- 4 a) How many bits are needed to store the result addition, subtraction, multiplication and division of two n-bit unsigned numbers. Prove.  
b) What is overflow and underflow? What is the reason?. If the computer is considered as infinite system do we still have these problems?
- 5 a) What is Virtual Memory? What are the issues behind the usage of this technique?  
b) Explain the direct mapping technique with example.
- 6 Write short notes on the following:
  - i) IOP (Input-Output-Processor)
  - ii) DMA Transfer
  - iii) Serial communication protocols
- 7 a) Discuss in detail about MESI protocol.  
b) List the merits and demerits of multi processors.
- 8 a) Explain the working of 8 x 8 Omega Switching network.  
b) Write short notes on inter processor communication.

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Code No: R31041

R10

Set No: 3

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

**COMPUTER ARCHITECTURE & ORGANIZATION**

(Electronics and Communication Engineering & Electronics and Instrumentation Engineering)

**Time: 3 Hours**

**Max Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

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- 1 a) Give the functional organization of a digital computer and explain the function of each element of a computer.  
b) Explain about sign magnitude and 2's complement approaches for representing the fixed point numbers. Why 2's complement is preferable.
- 2 Elaborate on different types of registers in a register organization.
- 3 a) Clearly distinguish between
  - i. Packed/Unpacked microinstructions
  - ii. Hard/Soft microprogrammingb) List and briefly explain applications of microprogramming.
- 4 a) What is the use of fast multiplication circuits. Write about array multipliers.  
b) Multiply 10111 with 10011 using booths algorithm.
- 5 a) What is a virtual memory technique? Explain different virtual memory techniques.  
b) Mention and explain the disk performance parameters?
- 6 a) Describe an asynchronous data transfer using hand shaking with the help of timing diagram.  
b) What is Direct Memory Access? Explain the working of DMA.
- 7 a) Mention and explain the problems in parallel processing?  
b) Write about Control Hazard?
- 8 a) What are the different interconnection structures used in multiprocessors?. Explain about multistage crossbar switch.  
b) Write short notes on System bus structure for multiprocessors.

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Code No: R31041

R10

Set No: 4

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

**COMPUTER ARCHITECTURE & ORGANIZATION**

(Electronics and Communication Engineering & Electronics and Instrumentation Engineering)

**Time: 3 Hours**

**Max Marks: 75**

Answer any FIVE Questions  
All Questions carry equal marks

\*\*\*\*\*

- 1 a) Explain about various buses such as internal, external, backplane, I/O, system, address, data, synchronous and asynchronous.  
b) Give means to identify whether or not an overflow has occurred in 2s complement addition or subtraction operations. Take one example for each possible situation and explain. Assume bit registers.
- 2 a) What is the need for various addressing modes? Explain various addressing modes with example?  
b) Differentiate between RISC and CISC.
- 3 a) Give the typical horizontal and vertical microinstruction formats.  
b) Describe how microinstructions are arranged in control memory and how they are interpreted.
- 4 a) Explain booth's algorithm with its theoretical basis.  
b) Why do we need some bits of current microinstruction to generate address of the next microinstruction. Support with a live example.
- 5 a) Explain the self-associative mapping technique with about example.  
b) Write about magnetic tape.
- 6 Explain the following:
  - (i) Isolated Vs Memory mapped I/O
  - (ii) I/O Bus Vs Memory Bus
  - (iii) I/O Interface
  - (iv) Peripheral Devices
- 7 Briefly explain about the following:
  - i) Cache Coherence
  - ii) Vector Computation
- 8 a) Classify and explain different multiprocessors.  
b) Explain the organization of tightly coupled multiprocessor system with a generic block diagram.

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Code No: R31051

R10

Set No: 1

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

**COMPILER DESIGN**  
(Computer Science and Engineering)

**Time: 3 Hours**

**Max Marks: 75**

Answer any FIVE Questions  
All Questions carry equal marks  
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1. (a) What are the functions of pre-processing?  
(b) Explain briefly, the need and functionality of linkers, assemblers and loaders.
2. Explain the role and functions of lexical analyser with the possible error recovery actions.
3. (a) Construct the LL(1) parse table for the following grammar;  
Program  $\rightarrow$  begin d semi X end  
X  $\rightarrow$  d semi X | s Y  
Y  $\rightarrow$  semi s Y |  $\epsilon$   
(b) Distinguish between top-down parsing and bottom-up parsing.
4. Construct the LR Parsing table for the following grammar:  
E  $\rightarrow$  E + T | T  
T  $\rightarrow$  T \* F | F  
F  $\rightarrow$  (E) | id
5. (a) Construct the CLR parsing table for the following grammar:  
S  $\rightarrow$  L=R | R  
L  $\rightarrow$  \*R | id  
R  $\rightarrow$  L  
(b) Differentiate between CLR and LALR parsing techniques.
6. (a) What is attributed grammar? Give the syntax-directed definition for a simple desk-calculator.  
(b) Explain with advantages and disadvantages of stack and heap storage allocation strategies for strings and records.
7. (a) List and explain the various intermediate code forms with an example each.  
(b) Give the primary structure preserving transformations on Basic Blocks.  
(c) Write a short note on procedure inlining.
8. (a) Explain various machine dependent code optimization techniques.  
(b) Write a short note on instruction scheduling.

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Code No: R31051

R10

Set No: 2

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

**COMPILER DESIGN**  
(Computer Science and Engineering)

**Time: 3 Hours**

**Max Marks: 75**

Answer any FIVE Questions  
All Questions carry equal marks  
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1. (a) Describe the Analysis-Synthesis model of compilation.  
(b) What are the different translation rules of a LEX program? Explain.
2. (a) Write a LEX program to recognise the decimal numbers.  
(b) What are the three general approaches to the implementation of a Lexical analyser? Explain.
3. (a) Construct LL(1) parse table for the following grammar.  
     $S \rightarrow AalbAc|BclbBa$   
     $A \rightarrow d$   
     $B \rightarrow d$   
(b) Explain error-recovery in predictive parsing.
4. (a) Explain the procedure for constructing set of LR(0) items.  
(b) Compute LR(0) items for the following grammar:  
     $S \rightarrow L=R | R$   
     $L \rightarrow *R | id$   
     $R \rightarrow L$
5. (a) Explain briefly about LALR parsing technique with an example.  
(b) Explain the various actions performed by shift-reduce parsers with an example.
6. (a) Construct the syntax directed definition to convert infix notation into postfix notation.  
(b) Explain the method of handling fixed length data and variable length data.
7. (a) Explain briefly, about the intermediate code generation phase of a compiler.  
(b) Explain various machine independent code optimization techniques.
8. (a) What is peephole optimization? Mention the transformations that are characteristic of peephole optimizations.  
(b) Explain the process of register allocation using graph coloring.

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Code No: R31051

R10

Set No: 3

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

**COMPILER DESIGN**

(Computer Science and Engineering)

**Time: 3 Hours**

**Max Marks: 75**

Answer any FIVE Questions  
All Questions carry equal marks

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1. (a) Mention the functions of linkers and loaders in pre-processing.  
(b) Describe the functionality of compilers in language processing.
2. (a) Construct the transition diagram to recognize the tokens for identifiers and relational numbers.  
(b) What are the reasons for separating lexical analysis from parsing?  
(c) Write a procedure for minimizing number of states of a DFA, and also explain with one example.
3. (a) Construct predictive parsing table for the following grammar:  
 $S \rightarrow (L) \mid a$   
 $L \rightarrow L, S \mid S$   
and check whether the following sentences belong to that grammar or not.  
(i) (a,a)  
(ii) (a, (a , a))  
(iii) (a, ((a , a), (a , a)) )  
(b) What are the differences between LL(1) Parsing and LL(k) Parsing?
4. (a) Construct the LR(0) items for the “dangling-else” grammar.  
(b) Write an algorithm for constructing LALR Parser table.
5. (a) What is a handle? Explain the method of handle pruning with an example.  
(b) Explain the various actions performed by shift-reduce parsers with an example.
6. (a) Construct the syntax directed translation scheme to convert a given arithmetic expression into three address code.  
(b) Explain the differences between static and dynamic storage allocation schemes.
7. (a) What are DAGs and how are they useful in implementing transformations on basic blocks?  
(b) Explain the principle sources of code improving transformations.
8. (a) Explain how garbage collection is done using reference count.  
(b) Discuss peephole optimization technique with an example.

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Code No: R31051

R10

Set No: 4

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

**COMPILER DESIGN**  
(Computer Science and Engineering)

Time: 3 Hours

Max Marks: 75

Answer any FIVE Questions  
All Questions carry equal marks  
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1. (a) Explain the phases in detail. Write down the output of each phase for the expression  
 $a: = b + c * 50$ .  
(b) Give and explain the diagrammatic representation of a language processing system.
2. (a) What is meant by input buffering? Explain the use of sentinels in recognizing tokens.  
(b) Explain the functions of lexical analyzer with its implementation.
3. (a) Calculate FIRST and FOLLOW sets for the following grammar:  
 $E \rightarrow TE'$   
 $E' \rightarrow +TE' \mid \epsilon$   
 $T \rightarrow FT'$   
 $T' \rightarrow *FT' \mid \epsilon$   
 $F \rightarrow (E) \mid id$   
(b) Explain the model of a non-recursive predictive parser with an example.
4. (a) Differentiate between LR parsing and LALR Parsing with an example.  
(b) Compute LR(0) items for the following grammar:  
 $S \rightarrow AB$   
 $A \rightarrow a \mid \epsilon$   
 $B \rightarrow b \mid \epsilon$
5. (a) What is a shift reduce parser? Mention the conflicts that occur during shift-reduce parsing.  
(b) Explain the way to implement a shift-reduce parser using a stack by taking an input string for a grammar.
6. (a) What is syntax-directed definition? Construct the syntax-directed definition to produce a syntax trees for assignment statements.  
(b) Explain various fields of an activation records by giving clear format of it.
7. (a) What are the steps involved in partitioning a Sequence of three address statements into basic blocks?  
(b) Explain the following code optimization techniques:  
(i) Constant folding    ii) Dead code elimination    iii) Strength reduction
8. (a) Describe the technique of inter procedural optimization  
(b) Explain any few machine dependent code optimization techniques.

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

**COMPUTER SYSTEM ORGANIZATION**

(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) Represent the number  $(+46.5)_{10}$  as a floating –point binary number with 24 bits. The normalized fraction mantissa has 16 bits and the exponent has 8 bits.  
b) Perform the arithmetic operations  $(+70) + (+80)$  and  $(-70)+(-80)$  with binary numbers in signed 2's complement representation . Use eight bits to accommodate each number together with its sign. Show that overflow occurs in both cases, that the last two carries are unequal, and that there is a sign reversal. [8+8]
2. a). Give list of 16 logical micro operations and explain truth tables for 16 functions in detail.  
b) With the arithmetic circuit function table explain about the operation of 4- bit arithmetic circuit [8+8]
3. a) Describe in detail about input output instructions  
b) Convert the following expressions from infix to reverse Polish notation.
  - i.  $A * B + C * D + E * F$
  - ii.  $A * B + A * (B * D + C * E)$
  - iii.  $A + B * [ C * D + E * (F + G)]$
  - iv.  $\frac{A + [B + C * 9(D + E)]}{F * (G + H)}$  [8+8]
4. A compute has 16 registers, an ALU (arithmetic logic unit) with 32 operations, and a shifter with eight operations, all connected to a common bus system.
  - i) Formulate a control word for a micro-operation.
  - ii) Specify the number of bits in each field of the control word and give a general encoding scheme.
  - iii) Show the bits of the control word that specify the micro-operation  $R4 \leftarrow R5 + R6$  [16]
5. a) Describe in detail about segmented paged mapping.  
b) What is the transfer rate of an eight –track magnetic tape whose speed is 120 inches per second and whose density is 1600 bits per inch? [8+8]
6. a) Give the circuit diagram of 4 X 4 FIFO buffer.  
b) Discuss in detail about daisy chaining method of establishing priority in I/O organization. [8+8]
7. a) Explain in detail about the sequence of steps to be performed in instruction pipeline.  
b) Describe in detail about vector processing and give the representative application areas where vector processing is applicable .Also give the instruction format for vector processor. [8+8]
8. a) Describe in detail about hyper cube interconnection and draw the hyper cube structure for  $n=1,2$  and 3  
b) Explain about serial arbitration procedure in detail. [8+8]

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**COMPUTER SYSTEM ORGANIZATION**

(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) Show the bit configuration of a 24 –bit register when its content represents the decimal equivalent of 295:
  - i) in binary ii) in BCD iii) in ASCII using eight bits with even parity
 b) Show that the exclusive-OR function  $x=A\oplus B\oplus C\oplus D$  is an odd function. Show that  $x=1$  only when the total number of 1's in A, B, C and D is odd. [8+8]
  
2. a) Consider the following register transfer statements for two 4-bit registers R1 and R2.
 
$$xT: R1 \leftarrow R1 + R2$$

$$x'T: R1 \leftarrow R2$$
 Every time that variable  $T=1$ , either the content of R2 is added to the content of R1 if  $x=1$ , or the content of R2 is transferred to R1 if  $x=0$ . Draw a diagram showing the hardware implementation of the two statements. Use block diagrams for the two 4-bit registers, a 4-bit adder, and a quadruple 2-to 1 line multiplexer that selects the inputs to R1. In the diagram, show how the control variables  $x$  and  $T$  selects the inputs of the multiplexer and the load input of register R1.
 b) Describe in detail about the memory transfer and explain with operation of memory unit. [8+8]
  
3. a) What is program interrupt and discuss about the flow chart for the interrupt cycle .
 b) Give block diagram of a 64 word stack and explain briefly about stack organization. [8+8]
  
4. a) Describe in detail about micro-programmed control organization.
 b) Explain in detail about the block diagram of a control memory and the associated hardware needed for selecting the next micro instruction address. [8+8]
  
5. a) A magnetic disk system has the following parameters:
 
$$T_s = \text{Average time to position the magnetic head over a track}$$

$$R = \text{Rotation speed of disk in revolutions per second}$$

$$N_t = \text{Number of bits per track}$$

$$N_s = \text{Number of bits per sector}$$
 Calculate the average time  $T_a$  that it will take to read one sector.
 b) Describe in detail about the organization of the memory mapping table in a paged system. [8+8]
  
6. a) Describe in detail about the block diagram of a typical asynchronous communication interface.
 b) Give a detailed note on direct memory access. [8+8]



Code No: V3108

**R07**

**Set No: 2**

7. a) Explain about the flow diagram of four segment CPU pipeline.  
b) Describe in detail about the problems encountered in instruction pipeline and discuss about handling branch instructions. [8+8]
8. a) What is cross bar switch and explain this with block diagram.  
b) Discuss the differences between tightly coupled multiprocessors and loosely coupled multiprocessors from the viewpoint of hardware organization and programming techniques. [8+8]

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

**COMPUTER SYSTEM ORGANIZATION**

(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) What is the radix of the numbers if the solution to the quadratic equation  $x^2 - 10x + 31 = 0$  is  $x=5$  and  $x=8$ ?  
b) Discuss in detail about error detection codes. [8+8]
  
2. a) The 8-bit registers AR, BR, CR and DR initially have the following values:  
AR=11110010  
BR=11111111  
CR=10111001  
DR=11101010  
Determine the 8-bit values in each register after the execution of the following sequence of micro operations.  
AR ← AR + BR  
CR ← CR ^ DR  
BR ← BR + 1  
AR ← AR - CR  
b) Explain in detail about one stage of logical unit with its functional table. [8+8]
  
3. a) What is addressing mode and discuss in detail about different addressing modes.  
b) Give the typical program control instructions and also explain about conditional branch instructions in detail. [8+8]
  
4. a) Show how a 9-bit micro-operation field in a microinstruction can be divided into subfields to specify 46 micro-operations. How many micro-operations can be specified in one micro instruction?  
b) Formulate a mapping procedure that provides eight consecutive micro-instructions for each routine. The operation code has six bits and the control memory has 2048 words. [8+8]
  
5. a) A computer uses RAM chips of 1024 X 1 capacity.  
(i) How many chips are needed, and how should their address lines be connected to provide a memory capacity of 1024 bytes?  
(ii) How many chips are needed to provide a memory capacity of 16K bytes? Explain in words how the chips are to be connected to the address bus.  
b) Describe in detail about mapping procedures when considering the organization of cache memory. [8+8]



6. a) What is the difference between isolated I/O and memory mapped I/O ? What are the advantages and disadvantages of each?  
b) Information is inserted into a FIFO buffer at a rate of  $m$  bytes per second. The information is deleted at a rate of  $n$  byte per second. The maximum capacity of the buffer is  $k$  bytes.
- i) How long does it take for an empty buffer to fill up when  $m > n$ ?
  - ii) How long does it take for a full buffer to empty when  $m < n$ ?
  - iii) Is the FIFO buffer needed if  $m = n$ ? [8+8]
7. a) Explain in detail about 4-segment pipeline with its space time diagram and also give the speed up of a pipeline processing over an equivalent non pipeline processing. [8+8]  
b) Describe in detail about RISC pipeline. [8+8]
8. a) Give and explain about the solutions for cache coherence problem.  
b) Explain about inter-processor synchronization and describe about mutual exclusion with semaphores. [8+8]

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

**COMPUTER SYSTEM ORGANIZATION**

(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) Perform the subtraction with the following unsigned binary numbers by taking the 2's complement of the subtrahend.
  - i) 11010-10000      ii) 11010-1101
  - iii) 100-110000      iv) 1010100-1010100
 b) Compare and contrast multiprocessors and multi-computers. [8+8]
  
2. a) Explain with functional table about the stage of arithmetic logic shift unit.  
 b) What is wrong with the following register transfer statements?  
 i) xT:  $AR \leftarrow \overline{AR}, AR \leftarrow 0$     ii) yT:  $R1 \leftarrow R2, R1 \leftarrow R3$     iii) zT:  $PC \leftarrow AR, PC \leftarrow PC+1$  [8+8]
  
3. a) Give the flowchart that summarizes all memory reference instructions.  
 b) Describe in detail about the basic characteristics of RISC processor. [8+8]
  
4. a) Describe in detail about the design of decoding of micro-operation fields .  
 b) Explain about mapping from instruction code to microinstruction address in detail. [8+8]
  
5. a) A computer employs RAM chips of 256 X 8 and ROM chips of 1024 X 8. The computer system needs 2K bytes of RAM, 4K bytes of ROM, and four interface units, each with four registers. A memory –mapped I/O configuration is used. The two highest- order bits of the address bus are assigned 00 for RAM, 01 for ROM and 10 for interface registers.
  - i) How many RAM and ROM chips are needed?
  - ii) Draw a memory address map for the system.
  - iii) Give the address range in hexadecimal for RAM, ROM and interface.
 b) Explain in detail about the organization of associative memory and also give the match logic for one word of associative memory. [8+8]
  
6. a) How many characters per second can be transmitted over a 1200 –baud line in each of the following modes? (Assume a character code of eight bits.)
  - i) Synchronous serial transmission
  - ii) Asynchronous serial transmission with two stop bits.
  - iii) Asynchronous serial transmission with one stop bit.
 b) Give example of I/O interface unit and with a block diagram. [8+8]
  
7. a) What is arithmetic pipeline and what are sub-operations performed in arithmetic pipeline? Explain about the pipeline for floating point addition and subtraction.  
 b) Elucidate about SIMD array processors in detail. [8+8]
  
8. a) Delineate about parallel bus arbitration technique.  
 b) Construct a diagram for a 4 X 4 omega switching network. Show the switch setting required to connect input 3 to output 1. [8+8]

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Code No: V3115

**R07**

**Set No: 1**

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

**AUTOMOBILE ENGINEERING**

(Mechanical Engineering)

**Time: 3 Hours**

**Max Marks: 80**

Answer any FIVE Questions  
All Questions carry equal marks

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- 1 (a). What are the functions of automobile chassis? State various types of chassis.  
(b). Differentiate between front axel and rear axel construction with neat diagram.
- 2 (a). Explain working of simple carburetor? Why different ratios of air and fuel are required?  
(b). Explain the common injection system used for multi cylinder diesel engines using the diagram and which type is used in latest engine.
- 3 (a). State the functions of ignition system? What are the elements in the circuit are required.  
(b). With a neat diagram explain water/liquid cooling system used in automobiles.
- 4 (a). Compare engine emissions and pollutants indicating their allowable ranges and their ill effects on human body.  
(b). Discuss in details various changes in fuel supply system of engines for controlling emission.
- 5 (a). With the help of line diagram, explain electrical and mechanical details of wiper mechanism.  
(b). With the help of schematic diagram, explain the working details of D.C generator of Dynamo and their ranges and applications.
- 6 (a). With the help of line diagram, explain the details of constant mesh gear box.  
(b). Explain the working details single plate clutch in different positions and which type is used in latest car.
- 7 (a). With the help of schematic diagram, explain the working details of Davis steering mechanism.  
(b). What are the functions of suspension system. Explain any one type of suspension system.
- 8 Write short notes on the following.
  - (a) Differential construction.
  - (b) Measurement of CO<sub>x</sub>
  - (c) Mechanical brake system.

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

**AUTOMOBILE ENGINEERING**

(Mechanical Engineering)

**Time: 3 Hours**

**Max Marks: 80**

Answer any FIVE Questions  
All Questions carry equal marks

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- 1 (a). What are the main components of an automobile? Describe all of them briefly.  
(b). How do you check the alignment of chassis frame? Explain clearly.
- 2 (a). Briefly mention the functions of a carburetor?  
(b). What types of fuel feed pumps are used in automotive diesel engine? Describe the construction and working of any such pump.
- 3 (a). State the functions of distributor and how the ignition advance is set and why?.  
(b). Draw neat diagram of spark plug and show various parts in it.
- 4 (a). Discuss the various pollutants in Automobile emission.  
(b). How smoke intensity is measured? Explain one method in detail along with its effects on human kind.
- 5 (a). With a circuit diagram explain self starting system in automobile.  
(b). Explain the working details of cut out relay and its uses with the help of line diagrams.
- 6 (a). Why differential is required? With a neat sketch explain construction of differential mechanism.  
(b). With a neat diagram explain the working of 5-speed synchromesh gear box working principle.
- 7 (a). With the help of neat sketch diagram of Tandam master cylinder? Explain the working details.  
(b). Explain the Ackerman steering mechanism.
- 8 Write short notes on.  
(a). Vacuum brakes.  
(b). Engine lubrication system.  
(c). Rear- end suspension system.

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

**AUTOMOBILE ENGINEERING**

(Mechanical Engineering)

**Time: 3 Hours**

**Max Marks: 80**

Answer any FIVE Questions  
All Questions carry equal marks

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- 1 (a). What are the various types of automobile chassis? State various parts of chassis with neat diagram.  
(b). What are the different types of lubrication system used in Automobiles. Explain pressure lubrication system with neat diagram.
- 2 (a). With a neat diagram explain the working principle of typical carburetor used in S.I Engine.  
(b). Why is choke used in a carburetor? Explain its usage in any carburetor.
- 3 (a). Name the different methods of engine cooling. Explain in detail the air cooling method.  
(b). Discuss the detail the requirements and the functions of an ignition system of an internal combustion engine.
- 4 (a). Compare the emissions of gasoline engine and diesel engine.  
(b). Explain briefly the exhaust gas recirculation device for the control NOx. Suggest the extreme limits of its presence in the exhaust gas.
- 5 (a). With a sketch, describe the working of a solenoid shift.  
(b). Explain the working of a typical lighting circuit used in Automobile.
- 6 (a). Why the transmission system is required? Explain Automatic transmission system used in Automobiles.  
(b). State advantages and disadvantages of multi plate clutch and single plate clutch used in Automobiles.
- 7 (a). Explain the Electronic power systems? Using line diagram.  
(b). Explain the working principle of a linkage – booster type power steering.
- 8 Write short notes on.  
(a). Objects of suspension system  
(b). Hydraulic brake system.  
(c). Turbo charging.

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

**AUTOMOBILE ENGINEERING**

(Mechanical Engineering)

**Time: 3 Hours**

**Max Marks: 80**

Answer any FIVE Questions  
All Questions carry equal marks

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- 1 (a).With a neat diagram state various parts of chassis and explain the construction.  
(b).What are the different types of lubrication systems used in Automobiles. Explain pressure lubrication system with neat diagram.
- 2 (a).Why is choke used in a carburetor? Explain its usage in any carburator.  
(b).With the help of neat sketches, explain the working details of air injection and solid injection their contrasts.
- 3 (a). Discuss the pump circulation cooling system thoroughly and compare the same with the Thermosyphon system.  
(b). Give detailed account of the battery ignition system. Illustrate your answer with neat sketches.
- 4 (a).Define smoke and explain the factors on which smoke is depending in CI engine and explain how to restrict that.  
(b). Explain in detail the effects of engine emissions on the human health.
- 5 (a).What are the advantages of using computer feedback control in the three way convertor?  
(b). Explain how an electric horn works with the help of a sketch?
- 6 (a). Explain clearly the necessity of a transmission in a vehicle.  
(b). Describe in detail various joints used in Automobile.
- 7 (a). Explain different steering linkages and their applications with the help of line diagrams.  
(b). Explain the details of hydraulic breaking system and specific applications.
- 8 Write short notes on.  
(a). Bendex derive mechanism, (b). Cross section of Carburetor., (c). Differential construction.

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Code No: V3119

R07

Set No: 1

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

**COMPUTER ORGANIZATION**

(Common to Electronics and Communication Engineering & Electronics and Instrumentation Engineering)

**Time: 3 Hours**

**Max Marks: 80**

Answer any FIVE Questions  
All Questions carry equal marks

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1. Explain the computer structure with and its component and their Functions in detail  
[16]
2. (a) Explain about stack organization used in processors. What do you understand by register stack and memory stack?  
(b) Explain how  $X=(A*B)/(A+B)$  is evaluated in a stack based computer. [10+6]
3. (a) How do we reduce number of microinstructions. What are micro-subroutines?  
(b) Hardwired control unit is faster than micro-programmed control unit. Justify this statement. [8+8]
4. Explain floating point arithmetic operations in detail with algorithm. [16]
5. (a) What is the functioning of a Flash Memory? Explain  
(b) Describe in words by means of a block diagram how multiple matched words can be read out from an associative memory [8+8]
6. Explain the following in detail  
(a) Programmed I/O  
(b) Interrupt- initiated I/O  
(c) Direct Memory Access (DMA) [5+5+6]
7. (a) What is pipeline? Explain with suitable diagram.  
(b) Explain instruction pipeline with suitable diagram. [8+8]
8. Explain the Interprocessor Arbitration and cache coherence in detail. [16]

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Code No: V3119

R07

Set No: 2

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

**COMPUTER ORGANIZATION**

(Common to Electronics and Communication Engineering & Electronics and Instrumentation Engineering)

**Time: 3 Hours**

**Max Marks: 80**

Answer any FIVE Questions  
All Questions carry equal marks

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1. Discuss about the various generations of computers in detailed [16]
2. (a) Design a circuit transferring data from a 4bit register which uses D flip-flops to another register which employs RS flip-flops.  
(b) What are the register transfer logic languages? Explain few RTL statement for branching with their actual functioning. [8+8]
3. (a) How do you map micro-operation to a micro instruction address?.  
(b) Explain the difference between hardwired control and micro programmed control. Is it possible to have a hardwired control associated with a control memory? [8+8]
4. (a) Explain the Addition and subtraction with unsigned-magnitude.  
(b) Explain the Booth multiplication algorithm [8+8]
5. Explain the following  
i. Auxiliary memory  
ii. Associative memory  
iii. Cache memory [5+6+5]
6. (a) Explain the various peripheral devices of a computer sytem.  
(b) Discus Input-Output Interface in detail [8+8].
7. (a) Explain four segment pipelining with relevant diagram.  
(b) Explain Array processors in detailed [8+8]
8. Explain the Interprocessor communication and synchronization in detail. [16]

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Code No: V3119

R07

Set No: 3

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

**COMPUTER ORGANIZATION**

(Common to Electronics and Communication Engineering & Electronics and Instrumentation Engineering)

**Time: 3 Hours**

**Max Marks: 80**

Answer any FIVE Questions  
All Questions carry equal marks

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1. (a) List and Explain the key characteristics of a computer.  
(b) Distinguish between error detection and correction codes. What do you understand by odd parity and even parity?. What is odd function and even function. To calculate odd and even parity values which functions can be used? [8+8]
2. Write about direct, indirect, register direct, register indirect, immediate, implicit, relative, index, and base address mode of addressing. Why do we need so many addressing modes? Is the instruction size influenced by the number of addressing modes which a processor supports? State whether the number of addressing modes will be more in RISC or CISC? [16]
3. (a) what is the difference between the microprocessor and a micro program? Is it possible to design a microprocessor without a micro program? Are all micro programmed computers also microprocessors? Explain.  
(b) Explain nanoinstructions and nanometry. Why do we need them? [8+8]
4. (a) What is an arithmetic processor? Explain.  
(b) Explain various decimal arithmetic operations. [8+8]
5. (a) Explain Memory hierarchy in detailed  
(b) Explain memory management hardware in detailed [8+8]
6. (a) Explain the Input-Output Processor (IOP) in detail.  
(b) Why does DMA have priority over the CPU when both request a memory transfer? [10+6]
7. Explain the following  
(a) RISC Pipeline  
(b) Array Processors. [8+8]
8. (a) Explain the characteristics of multiprocessors  
(b) Explain the functioning of Binary Tree network with 2 x 2 Switches. Show a neat diagram [8+8]

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Code No: V3119

R07

Set No: 4

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

**COMPUTER ORGANIZATION**

(Common to Electronics and Communication Engineering & Electronics and Instrumentation Engineering)

**Time: 3 Hours**

**Max Marks: 80**

Answer any FIVE Questions  
All Questions carry equal marks

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1. (a) Explain the computer system with various buses and their functions with a diagram.  
(b) assume numbers are represented in 8-bit twos complement representation. Show the calculation of the following:  
i)  $6+13$       ii)  $-6 + 13$       iii)  $6 - 13$       iv)  $-6-13$       [8+8]
2. (a) Explain about stack organization used in processors. What do you understand by register stack and memory stack?  
(b) Explain how  $X=(A+B)/(A-B)$  is evaluated in a stack based computer.      [10+6]
3. (a) Support the statement Instruction Set Architecture has impact on the processors micro architecture  
(b) Explain the design of hardwired control unit with relevant diagram      [8+8]
4. (a) Explain the Booth multiplication algorithm  
(b) Explain the decimal Arithmetic operations in detailed      [8+8]
5. (a) Explain the Memory Hierarchy with neat diagram.      [8+8]  
(b) A virtual memory has a page size of 1k words. There are eight pages and four blocks. The associative page table contains the following entries:

pages	0	1	4	6
Blocks	3	1	2	0

Make a list of all virtual addresses (in decimal) that will cause a page fault if used by the CPU      [8+8]

6. Explain various asynchronous data transfer modes in detail.      [16]
7. Explain the vector processing in detail with diagram      [16]
8. (a) Explain the working of 8 x 8 Omega Switching network.  
(b) Explain system bus structure for multiprocessors with a neat sketch.      [8+8]

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

**FORMAL LANGUAGES AND AUTOMATA THEORY**

(Common to Computer Science and Engineering)

**Time: 3 Hours**

**Max Marks: 80**

Answer any FIVE Questions  
All Questions carry equal marks

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1. a) Define string and alphabet and describe the operations on string.  
b) Define language? Describe its operations.
2. Prove the theorem 'Let L be a set accepted by non-deterministic finite automata, then there exists a DFA that accepts L'.
3. For any string  $w = w_1, w_2, \dots, w_n$  the reverse of w, written  $w^R$ , is the string w in reverse order  $w_n, \dots, w_2, w_1$ . For any language A let  $A^R = \{w^R \mid w \in A\}$  show that if A is regular so is  $A^R$ .
4. a) Let L be the language  $\{0^n 1^n \mid n \in \mathbb{N}\}$  is L context free? i.e. there is a grammar that generates L. Explain.  
b) Prove the theorem "Let  $G = (V, \Sigma, P, S)$  be a CFG. Then  $s \Rightarrow^* \infty$  if and only if there is a derivation tree for G with yield  $\infty$ ".
5. a) Prove that  $L = \{x \in \{a, b\}^* \mid \text{number of b's in } x \text{ is equal to the square of number of a's in } x\}$  is not a Context Free Language.  
b) Define Greibach Normal Form (GNF) for a CFG. Convert the following grammar into GNF.  

$$S \rightarrow AB$$

$$A \rightarrow BSB \mid BB$$

$$B \rightarrow aAb \mid a \mid b$$
6. a) Define a PDA. Design a PDA for  $L = \{xcx^r \mid x \in \{a,b\}^*\}$ . Process the string abba. Note:  $x^r$  stands for reverse of the string x.  
b) What do you mean by an instantaneous description of a PDA. Explain with example.
7. Define a Turing Machine(TM) and the language accepted by a TM. Design a TM for recognizing the language  $(a+b)^*aba(a+b)^*$ . Draw its transition diagram and table. Using the Instantaneous Description notation process the string aabaabaab.
8. a) Explain about Chomsky hierarchy of Languages.  
b) Explain in detail about Universal Turing Machine.

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

**FORMAL LANGUAGES AND AUTOMATA THEORY**

(Common to Computer Science and Engineering)

**Time: 3 Hours**

**Max Marks: 80**

Answer any FIVE Questions  
All Questions carry equal marks

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1. Give a finite state diagram that accepts all the floating point numbers.
2. Explain the procedure to convert NFA  $-\epsilon$  to ordinary NFA, with a suitable example.
3. Are the following languages regular? For each language give an automation that recognizes it and give a proof that it is not regular.
  - a)  $L = \{a^n b^n c^n\}$ , for  $\Sigma = \{a, b, c\}$ .
  - b)  $L = \{ww^R | w \in \Sigma^*\}$ , for  $\Sigma = \{0, 1\}$ .
  - c)  $L = \{ww | w \in \Sigma^*\}$ , for  $\Sigma = \{0, 1\}$ .
4.
  - a) Define context free grammar (CFG) and briefly explain the role of CFG in the programming language.
  - b) Derive the procedure for constructing a regular grammar from regular expression.
5.
  - a) Prove that  $L = \{x \in \{a, b, c\}^* \mid \text{number of } a\text{'s in } x \text{ is equal to the number of } b\text{'s or number of } c\text{'s in } x, \text{ which ever is maximum.}\}$  is not a CFL.
  - b) Show that the grammar with following productions is ambiguous.  
 $S \rightarrow a \mid abSb \mid aAb$                        $A \rightarrow bS \mid aAAb$
6.
  - a) Design a PDA for  $L = \{xx^r \mid x \in \{a, b\}^*\}$ . Process the string abbaabba. Is your PDA deterministic or non deterministic? Justify your answer.  
Note:  $x^r$  stands for reverse of the string  $x$ .
  - b) Explain the differences between a PDA and a FA.
7. Define a TM and the instantaneous description of a TM. Design a TM for recognizing  $L = \{x \in \{a, b\}^* \mid x \text{ ends with } aba\}$ . Specify its transition diagram. Process the strings abaaba and ababaa using ID notation.
8.
  - a) By giving suitable examples, explain NP hard and NP complete problems.
  - b) Show that the PCP with two lists  $x = (b, babbb, ba)$  and  $y = (bbb, ba, a)$  has a solution. Give the solution.

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

**FORMAL LANGUAGES AND AUTOMATA THEORY**

(Common to Computer Science and Engineering)

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

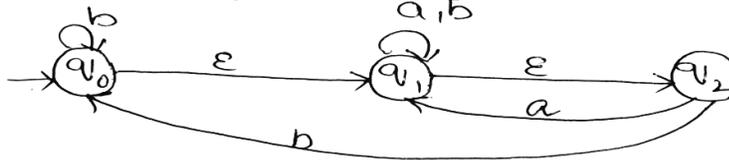
Answer any FIVE Questions

All Questions carry equal marks

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1. a) Describe the following languages over the input set  $A=\{a,b\}$ 
  - 1)  $L1 = \{a, ab, abb, aba\}$
  - 2)  $L2 = \{a^n b^n \mid n \geq 1\}$
  - 3)  $L3 = \{a^n b^n \mid n > 0\}$
- b) What is the Kleen closure? Let  $\Sigma = \{a,b\}$  obtain  
 $\Sigma^* = \Sigma^0 \cup \Sigma^1 \cup \Sigma^2 \cup \Sigma^3 \dots$

2. a) Write the conversion procedure of NFA with  $\epsilon$  to DFA.
- b) Convert the following NFA with  $\epsilon$  to equivalent DFA.



3. Consider the language  $L$  of strings that have an equal number of occurrences of "01" and "10" under each of the following alphabets. Is this language regular? For each alphabet, give an automation that recognizes it and prove that it is not regular.
  - a)  $\Sigma = \{0,1\}$ .
  - b)  $\Sigma = \{0,1,\#\}$ .
4. a) Consider  $G$  whose productions are  $S \rightarrow aAS|a$ ,  $A \rightarrow SbA|SS|ba$ . Show that  $s \Rightarrow aabbba$  and construct a derivation tree whose yield is  $aabbba$ .
- b) prove "if  $A \Rightarrow w$  in  $G$ , then there is a leftmost derivation of  $w$ ".
5. a) Decide whether  $L = \{xcx \mid x \in \{a, b\}^*\}$  is CFL or not.
- b) Prove that the grammar with following productions is ambiguous.
 
$$S \rightarrow aB \mid ab \quad A \rightarrow aAB \mid a \quad B \rightarrow ABb \mid b$$
6. a) When do we say that a PDA is non deterministic? Design a PDA for recognizing the language of palindromes over the input alphabet  $\{a, b\}$ .
- b) Distinguish between a DPDA and NPDA.
7. a) Design a TM for recognizing the language of palindromes over the input alphabet  $\{a, b\}$ . Show the moves of TM for the string  $abbba$ .
- b) What is Instantaneous Description of a TM? Briefly explain.
8. a) Explain the universal TM in detail.
- b) Write short notes on PCP and MPCP with examples.

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

**FORMAL LANGUAGES AND AUTOMATA THEORY**

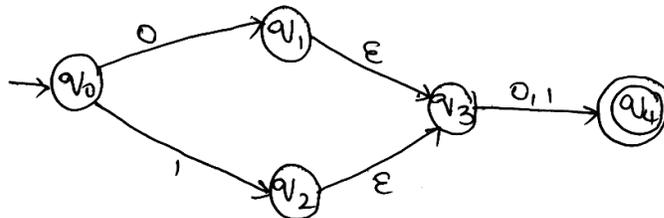
(Common to Computer Science and Engineering)

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

Answer any FIVE Questions  
All Questions carry equal marks

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- What is the finite state machine? Define finite automata and describe the representation of finite automata.
  - Discuss the applications of finite automata.
- Convert the given NFA with  $\Sigma$  to its equivalent DFA.



- What is the "Minimization of FSM"? Explain the method for construction of minimum state automata.
- Write a regular expression to denote a language L which accepts all the strings that begin or end with either 00 or 11.
    - Construct a regular expression for the language which accept all strings with at least two c's over the set  $\Sigma = \{c, b\}$
    - Construct a regular expression for the language over the set  $\Sigma = \{a, b\}$  in which the total number of a's are divisible by 3.
  - Explain in detail, the right and left linear grammars with example.
    - Explain the equivalence and differences between regular grammar and finite automata.
  - Prove that  $L = \{ a^i b^j c^k \mid i \geq j \text{ or } i \geq k \}$  is a CFL but its complement is not.
  - When do you say that a language L is recognized or accepted by a PDA? Design PDA for  $L = \{ a^i b^j c^k \mid j \geq i+k \text{ and } i, j, k > 0 \}$ . Process the string aaabbbbbbbccc using instantaneous description.
  - Design a TM for recognizing  $L = \{ xx \mid x \in \{a, b\}^* \}$ . Show the moves of the TM for the strings abaaba and abaabb.
  - Define LR(0) grammar. Specify a grammar and show that it is LR(0).
    - Describe the P and NP computational complexity of problems with suitable examples.

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

**AUTOMATA AND COMPILER DESIGN**

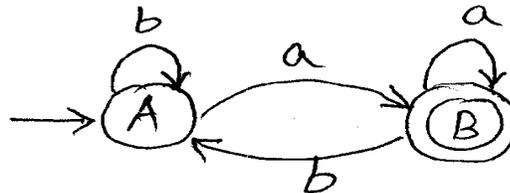
(Information Technology)

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

Answer any FIVE Questions  
All Questions carry equal marks

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1. (a) Show that the simplified regular expression recognized by the following DFA is the set of all strings of  $a$ 's and  $b$ 's that end with letter  $a$ .



- (b) Show that the following regular expression identities are equivalent:

(i)  $r^+ = r^* r^+$

(ii)  $(r + s)^* = (r + s^*)^*$

[8+8]

2. (a) Construct a context free grammar for generating the balanced parentheses, like  $()$ ,  $[\ ]$ ,  $(\ )$ ,  $([\ ])$ ,  $([\ ])$ , etc. and find the moves of the grammar to derive the string:  $([\ ])(\ )$   
(b) Find the entries:  $M[S, i]$  and  $M[R, \$]$  of the predictive parse table,  $M$  of the following grammar:

$$\begin{aligned} S &\rightarrow FR \\ R &\rightarrow *S \mid \epsilon \\ F &\rightarrow i \end{aligned}$$

[8+8]

3. Consider the grammar:  $S \rightarrow (S) \mid a$   
(a) Construct the DFA for SLR(1), CLR(1), and LALR(1) parsers  
(b) Find the number of states in each of the parser.

[8+8]

4. (a) Compare inherited attributes and synthesized attributes with an example.  
(b) Construct quadruples, triples, and indirect triples of the following expression by assuming the usual rules of precedence for the operators:  
 $(a + b) > (c + d)$  OR  $a > c$  AND  $b < d$

[8+8]

5. (a) What is type checking? How does it work? Compare static and dynamic type checking techniques with suitable examples.  
(b) What is a polymorphic function? Give an example.  
(c) Compare context sensitive and context free languages with suitable examples. [8+4+4]

6. (a) Explain, in detail, the storage allocation for strings, arrays and records.  
(b) Consider the array declaration in 'c':  $\text{float } a[100][100]$ ; Assume that the main memory is byte addressable and that the array is stored starting from the memory address 100. What is the address of  $a[40][50]$ ?  
(c) What is a display? Describe its need with an example.

[8+4+4]



7. (a) What is a code optimization? Explain a machine dependent and machine independent code optimization with suitable examples.  
(b) Explain data flow analysis of structured programs with suitable examples. [8+8]
8. (a) How registers are allocated and assigned in order to generate good code? Explain with an example.  
(b) What is a basic block? Construct a DAG for the following basic block:  
 $t1 = t2 * t3$ ;  $t2 = t6 + t4$ ;  $t3 = t4 - e$ ;  $t4 = t5 * t8$ ;  $t5 = t6 - c$ ;  $t6 = a + b$ ;  $t8 = d + e$ ;  
[8+8]

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

**AUTOMATA AND COMPILER DESIGN**

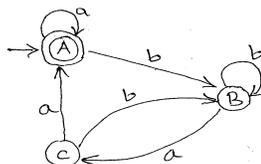
(Information Technology)

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

Answer any FIVE Questions  
All Questions carry equal marks

\*\*\*\*\*

1. (a) Find the regular expression for the following finite automaton:



- (b) Design a DFA that accepts the language over the alphabet,  $\Sigma = \{0, 1, 2\}$  where the decimal equivalent of the language is *not* divisible by 3. [8+8]

2. (a) Give the context free grammar that generates the set  $\{0^n 1^n \mid n \geq 1\}$   
(b) Build an LL(1) parse table for the following production grammar: [8+8]

Program  $\rightarrow$  begin d semi X end

X  $\rightarrow$  d semi X | s Y

Y  $\rightarrow$  semi s Y |  $\epsilon$

3. Consider the following augmented grammar:

$S \rightarrow A$

$A \rightarrow BA \mid \epsilon$

$B \rightarrow aB \mid b$

- (a) Construct the LR(1) parser.  
(b) Find the moves made by the LR(1) parser on the input string: a a b b [8+8]

4. Consider the following:

$E \rightarrow E_1 \# T \{E.val := E_1.val * T.val\}$

$E \rightarrow T \{E.val := T.val\}$

$T \rightarrow T_1 \& F \{T.val := T_1.val * F.val\}$

$T \rightarrow F \{T.val := F.val\}$

$F \rightarrow num \{F.val := num.Lexval\}$

- (a) Draw an annotated parse tree for an expression: a # b & c # d & e  
(b) Compute the 'E.val' for root of an annotated parse tree of the following expression: [8+8]  
2 # 3 & 5 # 6 & 4

5. (a) What is a type expression? Explain the equivalence of type expressions with an example.  
(b) Explain the chomsky's hierarchical theorem.  
(c) Compare polymorphic and overloading of functions with an example. [8+4+4]



Code No: V3147

**R07**

**Set No: 2**

6. (a) What is an activation record? Explain its components with an example.  
(b) What is a dangling reference problem in storage allocation? Write the 'C' functions which likely to cause dangling reference problem. [8+8]
  
7. (a) What is dataflow analysis? Explain about various dataflow analyzers.  
(b) Explain, in detail, about peephole optimization with suitable examples. [8+8]
  
8. (a) What are various object code forms? Explain.  
(b) What is a register allocation and assignment? Give an example.  
(c) Write the code generation algorithm. Test the algorithm for the following expression:  
$$W = (A - B) * (A - C - B) + (A - B - C)$$

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[5+5+6]



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**AUTOMATA AND COMPILER DESIGN**

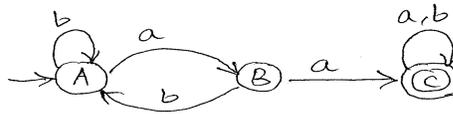
(Information Technology)

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

Answer any FIVE Questions  
All Questions carry equal marks

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1. (a) Design a DFA that accepts the language over  $\Sigma = \{0, 1\}$  of all strings that contain neither the sub-string 00 nor the sub-string 11.  
(b) When are two regular expressions said to be equivalent? Find the regular expression for the following finite automaton: [8+8]



2. (a) Construct a context free grammar for possible sequences of **if - else** in 'C' and find the moves of the grammar to derive the if - else sequence of the string: i i e i e  
(b) Find the entries:  $M[S, i]$  and  $M[R, \$]$  of the predictive parse table, M of the following grammar: [8+8]

$$\begin{aligned} S &\rightarrow FR \\ R &\rightarrow *S \mid \epsilon \\ F &\rightarrow i \end{aligned}$$

3. (a) What is meant by a parser generator? How are ambiguities resolved in YACC? Explain.  
(b) Consider the following augmented grammar:

$$\begin{aligned} A' &\rightarrow A \\ A &\rightarrow (A) \mid a \end{aligned}$$

Construct the LR(0) parser and find the moves made by the LR(0) parser on the input string: ((a)) [8+8]

4. (a) Design an abstract syntax tree for the expression:  $a = (a[i+1] = 2) + a[j]$   
(b) Let synthesized attribute, Val give the value of the binary number generated by S in the following grammar. For example, on input 101.101,  $S.Val = 5.625$ .

$$\begin{aligned} S &\rightarrow L \bullet L \mid L \\ L &\rightarrow LB \mid B \\ B &\rightarrow 0 \mid 1 \end{aligned}$$

Write synthesized attribute values corresponding to each of the productions to determine the S.Val [8+8]

5. (a) What is type checking? How does it work? Compare static and dynamic type checking techniques with suitable examples.  
(b) What is a Polymorphic function? Give an example.  
(c) Compare context sensitive and context free languages with suitable examples. [8+4+4]



6. (a) What is a display? Describe its need with an example.  
 (b) Consider the following "C" declaration:

```
struct
{
    short s1[5]; long l; union { short s2; float y; long z; }u;
}t;
```

Assume that the objects of the type short, float, and long occupy 2 bytes, 4 bytes, and 8 bytes, respectively. Find the storage requirement for variable 't', ignoring alignment considerations.

- (c) An array A is declared in FORTRAN as: DIMENSION(8, 10). The implementation uses column-major strategy and the array begins at 100. If each element of A occupies 4 bytes, at what byte does element A(4, 7)? [6+5+5]

7. (a) Explain data flow analysis of structured programs with suitable examples.  
 (b) What is a code optimization? Explain, in detail, about local optimization, loop optimization and peephole optimization with suitable examples. [8+8]
8. (a) Describe, in detail, about the issues in the design of code generator.  
 (b) Write the code generation algorithm. Test the algorithm for the following expression:  
 $W = (A - B) + (A - C) + (A - C) + (A - C)$  [8+8]

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

**AUTOMATA AND COMPILER DESIGN**

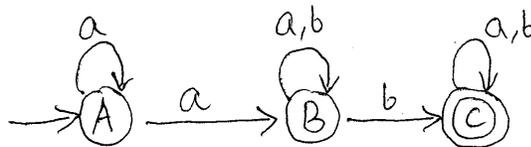
(Information Technology)

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

Answer any FIVE Questions  
All Questions carry equal marks

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1. (a) Construct a DFA equivalent to the following NFA diagram:



- (b) Prove the following regular expression identities:

$$\epsilon + 1^* (011)^* (1^* (011)^* )^* = (1 + 011)^*$$

$$1 + (\epsilon + 0)(\epsilon + 0)^* 1 = 0^* 1$$

[8+8]

2. (a) Write a context free grammar for the **while** statement in 'C' language.

- (b) Build an LL(1) parse table for the following production grammar:

[8+8]

Program  $\rightarrow$  begin d semi X end

X  $\rightarrow$  d semi X | s Y

Y  $\rightarrow$  semi s Y |  $\epsilon$

3. (a) What are Kernel and Non-kernel items? Obtain the Kernel items of the LR(0) parser for the grammar:

A  $\rightarrow$  A'

A'  $\rightarrow$  a A' | b

- (b) Explain how to parse an ambiguous grammar. How are ambiguities resolved in YACC?

[8+8]

4. (a) What is an attribute grammar? Give an example.

- (b) Translate the executable statements of the following 'C' program into a three-address code by assuming each element of an array 'a' takes 4 bytes.

[6+10]

```
void main()
```

```
{
```

```
    int i = 1, a[10];
```

```
    while(i++ <= 10) a[i] = 0;
```

```
}
```

5. (a) What is LBA? What is PDA? Explain, in detail, with suitable diagrams and examples.

- (b) Explain the chomsky's hierarchical theorem.

- (c) Compare polymorphic and overloading of functions with an example.

[8+4+4]



6. (a) Explain, in detail, the storage allocation for strings, arrays and records.  
(b) What is a dangling reference problem in storage allocation? Write the 'C' functions which likely to cause dangling reference problem. [8+8]
7. (a) What is dataflow analysis? Explain, in detail, global data flow analysis.  
(b) Write and explain live variable analysis algorithm with an example. [8+8]
8. (a) What is the role of code generator? What is the purpose of next use information in code generation? Give an example.  
(b) Write the code generation algorithm. Test the algorithm for the following expression:  
$$W = (A - B) * (A - C - B) + (A - B - C)$$

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