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10MAT/PM/TL/MA31

Third Semester B.E. Degree Examination, December 2011

Engineering Mathematics – III

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer any FIVE full questions, selecting at least TWO questions from each part.***
2. ***Missing data will be suitably assumed.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

PART – A

1 a. Obtain the Fourier series for the function $f(x) = \begin{cases} \pi x & : 0 \le x \le 1 \\ \pi(2-x) & : 1 \le x \le 2 \end{cases}$ and deduce that $\frac{\pi^2}{8} = \sum_{n=1}^{\infty} \frac{1}{(2n-1)^2}$. **(07 Marks)**

b. Obtain the half range Fourier sine series for the function. **(07 Marks)**
$$f(x) = \begin{cases} 1/4 - x \ ; & 0 < x < 1/2 \\ x - 3/4 \ ; & 1/2 < x < 1 \end{cases}.$$

c. Compute the constant term and the first two harmonics in the Fourier series of f(x) given by the following table. **(06 Marks)**

x :	0	1	2	3	4	5
f(x) :	4	8	15	7	6	2

2 a. Find the Fourier transform of $f(x) = \begin{cases} 1 - x^2 & \text{for} \quad |x| \le 1 \\ 0 & \text{for} \quad |x| > 1 \end{cases}$ and hence evaluate $\int_0^{\infty} \left(\frac{x\cos x - \sin x}{x^3} \right) \cos\frac{x}{2} \, dx$. **(07 Marks)**

b. Find the Fourier cosine transform of $f(x) = \frac{1}{1+x^2}$. **(07 Marks)**

c. Solve the integral equation $\int_0^{\infty} f(\theta)\cos\alpha\theta \, d\theta = \begin{cases} 1-\alpha \ ; & 0 \le \alpha \le 1 \\ 0 \ ; & \alpha > 1 \end{cases}$. Hence evaluate $\int_0^{\infty} \frac{\sin^2 t}{t^2} dt$. **(06 Marks)**

3 a. Solve two dimensional Laplace equation $u_{xx} + u_{yy} = 0$, by the method of separation of variables. **(07 Marks)**

b. Solve the one dimensional heat equation $\frac{\partial u}{\partial t} = \frac{c^2 \partial^2 u}{\partial x^2}$, $0 < x < \pi$ under the conditions :
i) $u(0,+) = 0, u(\pi, t) = 0$ ii) $u(x, 0) = u_0 \sin x$ where u_0 = constant ‡ 0. **(07 Marks)**

c. Obtain the D` Alembert's solution of one dimensional wave equation. **(06 Marks)**

4 a. Fit a curve of the form $y = ae^{bx}$ to the following data : **(07 Marks)**

x :	77	100	185	239	285
y :	2.4	3.4	7.0	11.1	19.6

b. Using graphical method solve the L.P.P minimize $z = 20x_1 + 10x_2$ subject to the constraints $x_1 + 2x_2 \le 40$; $3x_1 + x_2 \ge 0$; $4x_1 + 3x_2 \ge 60$; $x_1 \ge 0$; $x_2 \ge 0$. **(06 Marks)**

c. Solve the following L.P.P maximize $z = 2x_1 + 3x_2 + x_3$, subject to the constraints $x_1 + 2x_2 + 5x_3 \le 19$, $3x_1 + x_2 + 4x_3 \le 25$, $x_1 \ge 0$, $x_2 \ge 0$, $x_3 \ge 0$ using simplex method. **(07 Marks)**

PART – B

5 a. Using the Regula – falsi method, find the root of the equation $xe^x = \cos x$ that lies between 0.4 and 0.6. Carry out four iterations. **(07 Marks)**

b. Using relaxation method solve the equations :
$10x - 2y - 3z = 205$; $-2x + 10y - 2z = 154$; $-2x - y + 10z = 120$. **(07 Marks)**

c. Using the Rayleigh's power method, find the dominant eigen value and the corresponding eigen vector of the matrix. $A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ starting with the initial vector $[1,1,1]^T$. **(06 Marks)**

6 a. From the following table, estimate the number of students who have obtained the marks between 40 and 45 : **(07 Marks)**

Marks :	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80
Number of students :	31	42	51	35	31

b. Using Lagrange's formula, find the interpolating polynomial that approximate the function described by the following table : **(07 Marks)**

x :	0	1	2	5
f (x) :	2	3	12	147

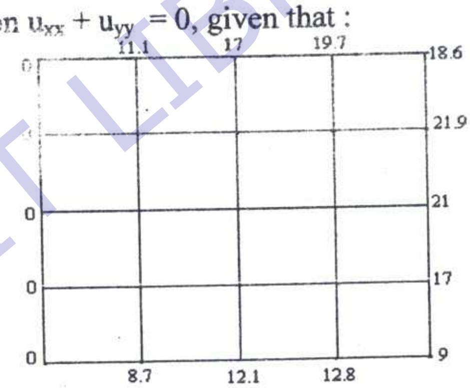
Hence find f(3)

c. A curve is drawn to pass through the points given by the following table :

x :	1	1.5	2	2.5	3	3.5	4
y :	2	2.4	2.7	2.8	3	2.6	2.1

Using Weddle's rule, estimate the area bounded by the curve, the x – axis and the lines $x = 1$, $x = 4$. **(06 Marks)**

7 a. Solve the Laplace's equation $u_{xx} + u_{yy} = 0$, given that : **(07 Marks)**



b. Solve $\dfrac{\partial^2 u}{\partial t^2} = 4\dfrac{\partial^2 u}{\partial x^2}$ subject to $u(0, t) = 0$; $u(4, t) = 0$; $u(x, 0) = x(4 - x)$. Take $h = 1$, $k = 0.5$. **(07 Marks)**

c. Solve the equation $\dfrac{\partial u}{\partial t} = \dfrac{\partial^2 u}{\partial x^2}$ subject to the conditions $u(x, 0) = \sin \pi x$, $0 \le x \le 1$; $u(0\ t) = u(1, t) = 0$ using Schmidt's method. Carry out computations for two levels, taking $h - 1/3$, $k = 1/36$. **(06 Marks)**

8 a. Find the Z – transform of : i) $(2n-1)^2$ ii) $\cos\left(\dfrac{n\pi}{2} + \pi/4\right)$ **(07 Marks)**

b. Obtain the inverse Z – transform of $\dfrac{4z^2 - 2z}{z^3 - 5z^2 + 8z - 4}$. **(07 Marks)**

c. Solve the difference equation $y_{n+2} + 6y_{n+1} + 9y_n = 2n$ with $y_0 = y_1 = 0$ using Z transforms. **(06 Marks)**

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10CS32

Third Semester B.E. Degree Examination, December 2011

Electronic Circuits

Time: 3 hrs. Max. Marks:100

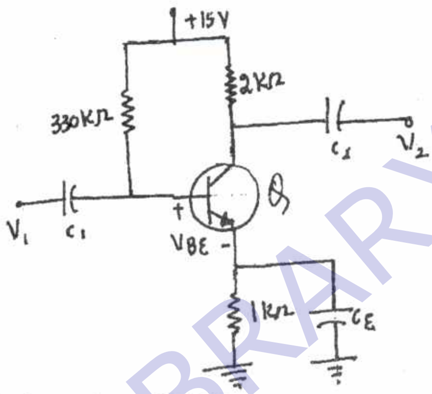
Note: ***1. Answer any FIVE full questions, selecting at least TWO questions from each part.***
2. Any missing data may be assumed suitably.

PART – A

1 a. Discuss with neat sketches, the relation of operating point of transistor for following cases : i) Neat saturation region ; ii) Neat cut – off region ; iii) At the centre of active region. **(08 Marks)**

b. For the circuit shown in Fig.Q.1(b), calculate I_B, I_C, V_{CE}, V_C, V_E, V_B and V_{BC}. Assume B = 100. **(08 Marks)**

Fig.Q.1(b)



c. Explain the basic methods of triggering of SCR. **(04 Marks)**

2 a. Explain with neat sketches, the operation, characteristics and parameters of n – channel depletion type MOSFET. **(08 Marks)**

b. Explain with neat sketches, the operation of JFET along with its characteristic curves. **(08 Marks)**

c. Discuss merits, demerits and applications of IGBTs. **(04 Marks)**

3 a. Discuss the classification of optoelectronic devices, in detail. **(06 Marks)**

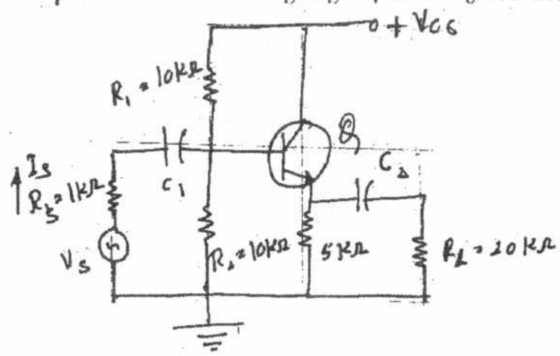
b. Explain with neat diagrams, the principle of operation, characteristics, advantages, disadvantages and applications of a photodiode. **(08 Marks)**

c. Briefly discuss with necessary diagrams, the basic operation and construction of LED. **(06 Marks)**

4 a. Obtain the expression for current gain, input impedence voltage gain, output impedance power gain of a transistor amplifier using complete h – parameter model. **(08 Marks)**

b. In the common collector shown in Fig.Q.4(b), the transistor parameters are h_{ic} = 1.2 k , h_{fc} = -101 , h_{rc} = 1 and h_{oc} = 25 μA/v. Calculate R_i, A_i, A_v and R_o for the circuit. **(08 Marks)**

Fig.Q.4(b)



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c. Explain common emitter, common collector amplifier along with its a.c. equivalent circuit. **(04 Marks)**

PART – B

5 a. Explain the classification of large signal amplifiers as class A, class B, class C and class AB amplifiers. **(06 Marks)**

b. An amplifier with openloop voltage gain of 1000, delivers 10W of power output at 10% second harmonic distortion when i/p is 10 mV. A 40 dB negative feedback is applied and output paver is to remain at 10W. Determine required input signal V_s and second harmonic distortion with feedback. **(08 Marks)**

c. Explain the advantages and disadvantages of negative feedback. **(06 Marks)**

6 a. Explain with a neat diagram Hartley oscillater and calpits oscillate as LC oscillator. **(06 Marks)**

b. Explain the various types of multivibrators. Also mention the applications. **(06 Marks)**

c. Obtain the expression for time period T at the base of transistor, in case of wave shaping circuits. **(08 Marks)**

7 a. Explain with a functional block diagram, a typical three terminal IC voltage regulator. **(06 Marks)**

b. Discuss the limitations of linear voltage regulators. **(06 Marks)**

c. Briefly discuss power converters in series and parallel connection along with neat diagrams. **(08 Marks)**

8 a. Discuss the requirements of a good instrumentation amplifier. **(06 Marks)**

b. Fig.Q.8(b) shows dual input, balanced output and differential amplifier configuration. Assuming silica transistor with h_{ie} = 2.8 KΩ, calculate : i) Operating point valves ; ii) Differential gain ; iii) Common mode gain ; iv) CMRR ; v) Output if V_{S_1} = 70 mV peak to peak at 1 kHz ; vi) V_{S_2} = 40 mV peak to peak at 1 kHz. **(10 Marks)**

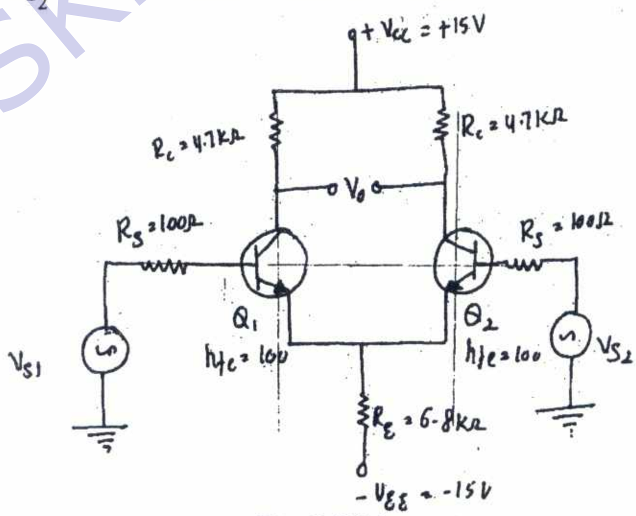

Fig.Q.8(b)

c. Explain the various electrical characteristics of an ap-amp which are generally in the data sheet. **(04 Marks)**

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10CS33

Third Semester B.E. Degree Examination, December 2011
Logic Design

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

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PART – A

1 a. Draw the truth table and explain how a TTL NAND gate works. **(06 Marks)**
b. An asymmetrical signal waveform is high for 2msec and low for 5msec. Find the frequency and the duty cycle L of the waveform. **(04 Marks)**
c. Discuss the positive and negative logic and list the equivalences in positive and negative logic. **(05 Marks)**
d. Draw the timing diagram and write a Verilog HDL code (using structural model) for the Boolean function Y = NAND(Y1, Y2); where Y1 = A + B, Y2 = B + C. **(05 Marks)**

2 a. A digital system is to be designed in which the months of the year is given as input in four bit form. The month January is represented as '0000', February as '0001' and so on. The output of the system should be '1' corresponding to the input of the month containing 31 days or otherwise it is '0'. Consider the excess numbers in the input beyond '1011' as don't care conditions. For this system of four variables (A, B, C, D), find the following :
i) Boolean expression in Σm and πM form
ii) Write the truth table
iii) Using K-map, simplify the Boolean expression of canonical min term form
iv) Implement the simplified equation using NAND-NAND gates. **(10 Marks)**
b. Using Q-M method, simplify the expression f(A, B C, D) = Σ(0, 3, 5, 6, 7, 11, 14). Write the gate diagram for the simplified equation using NAND-NAND gates. **(10 Marks)**

3 a. Implement the Boolean function expressed by POS, f(A, B, C, D) = π(1, 2, 5, 6, 9, 12) using 8-to-1 MUX. **(08 Marks)**
b. Draw a PLA circuit to simultaneously realize the Boolean functions Y3 = A′BC′ ; Y2 = AC ; Y1 = AB′C + A′BC + ABC′ ; Y0 = A′BC′ + A′BC + A′B′C′ + ABC. **(06 Marks)**
c. Implement a full adder using a 3-to-8 decoder. **(06 Marks)**

4 a. Draw the logic diagram of clocked 'D' flip-flop. Write its truth table, characteristic equation, state diagram and excitation table. What is the drawback of SR flip-flop? **(10 Marks)**
b. Explain the Schmitt-Trigger transfer characteristic. **(06 Marks)**
c. Using behavioral model, write verilog HDL code for a 'D' flip-flop. **(04 Marks)**

PART – B

5 a. Using negative edge triggered JK flip-flops, draw the logic diagram of a 4-bit serial In - serial Out shift register. Draw the waveform to shift the binary number 1010 into this register. Also, draw the waveforms for four clock transitions when J = K = 0 (assuming the register has stored 1010 in it). **(08 Marks)**
b. How long will it take to shift the hexadecimal number 'AB' into the 54/74164 (SIPO) if 5MHz clock is connected to it? Also, mention the time required to extract an 8-bit number from the same register. **(04 Marks)**
c. With a neat diagram, explain a 4-bit universal shift register. **(05 Marks)**
d. Write Verilog code for switched-tail counter using 'assign' and 'always' statements. **(03 Marks)**

6 a. Mention any two differences between asynchronous and synchronous counter. With a neat block diagram, output waveforms and truth table. Explain a 3-bit binary Ripple Down-Counter constructed using negative-edge trigged JK flip-flops. **(10 Marks)**

b. A 4-bit binary asynchronous counter is connected with a clock of 500 KHz frequency. Find the time period of the waveform at the output of the first and the last JK flipflop. **(02 Marks)**

c. Design a synchronous mod-6 counter using JK flipflop. **(08 Marks)**

7 a. Compare Moore and Mealy model of synchronous sequential circuit. **(06 Marks)**

b. Design an asynchronous sequential logic circuit for state transition diagram shown in Fig.Q7(b).

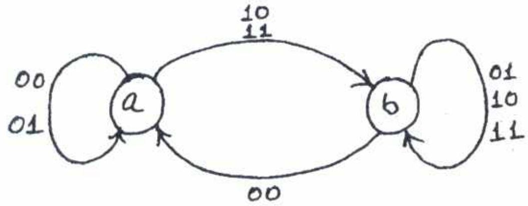

Fig.Q7(b) **(06 Marks)**

c. Reduce state transition diagram (Moore model) of Fig.Q7(c) by,
i) Row elimination method ii) Implication table method. **(08 Marks)**

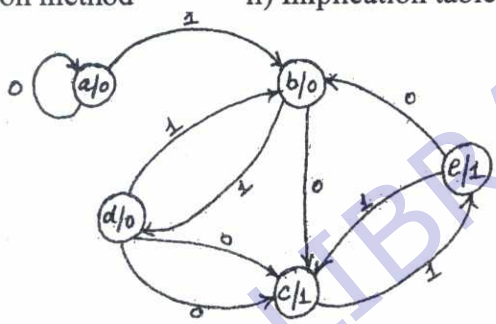

Fig.Q7(c)

8 a. Discuss the two drawbacks of resistive divider used in converting digital input to analog output. Draw the schematic for a 4-bit binary ladder and explain how the digital to analog conversion is achieved using it. **(10 Marks)**

b. Using a schematic block diagram, briefly explain counter type ADC. **(08 Marks)**

c. A counter type 10 bit ADC is connected with 7 MHz clock. Find :
i) The average conversion time
ii) The maximum conversion rate. **(02 Marks)**

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Third Semester B.E. Degree Examination, December 2011
Discrete Mathematical Structures

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions atleast TWO questions from each part.***

PART – A

1 a. If N is the set of positive integers and R is the set of real numbers, examine which of the following sets is empty :
i) $\{x \mid x \in N, 2x + 7 = 3\}$
ii) $\{x \mid x \in R, x^2 + 4 = 6\}$
iii) $\{x \mid x \in R, x^2 + 3x + 3 = 0\}$. **(04 Marks)**

b. Using Venn diagrams, investigate the truth or falsity of :
i) $A \Delta (B \cap C) = (A \Delta B) \cap (A \Delta C)$
ii) $A - (B \cup C) = (A - B) \cap (A - C)$ for any three sets A, B, C. **(06 Marks)**

c. Simplify the following :
i) $A \cap (B - A)$
ii) $(A \cap B) \cup (A \cap B) \cup (A \cap B \cap \bar{C} \cap D)$. **(05 Marks)**

d. A fair coin is tossed five times. What is the probability that the number of heads always exceeds the number of tails as each outcome is observed. **(05 Marks)**

2 a. Write the following in symbolic form and establish if the argument is valid : If A gets the supervisor's position and works hard, then he will get a raise. If he gets a raise, then he will buy a new car. He has not bought a new car. Therefore A did not get the supervisor's position or he did not work hard. **(05 Marks)**

b. Verify the following without, using truth tables :
$[(p \to q) \wedge (\neg r \vee s) \wedge (p \vee r)] \therefore \neg q \to s$. **(05 Marks)**

c. Define tautology. Show that $[(p \vee q) \wedge (p \to r) \wedge (q \to r)] \to r$ is a tautology, by constructing a truth table. **(05 Marks)**

d. Show that the following argument is invalid by giving a counter example :
$[(p \wedge \neg q) \wedge \{p \to (q \to r)\}] \to \neg r$. **(05 Marks)**

3 a. Verify if the following is valid :
$\forall x[p(x) \vee q(x)]$; $\exists x \neg p(x)$
$\forall x[\neg g(x) \vee r(x)]$
$\forall x[s(x) \to \neg r(x)] \therefore \exists x \neg s(x)$. **(05 Marks)**

b. Prove that for all real numbers x and y, if $x + y > 100$, then $x > 50$ or $y > 50$. **(05 Marks)**

c. Determine if the argument is valid or not. All people concerned about the environment, recycle their plastic containers. B is not concerned about the environment. Therefore, B does not recycle his plastic containers. **(05 Marks)**

d. Negate and simplify :
i) $\forall x[p(x) \wedge \neg q(x)]$
ii) $\exists x [(p(x) \vee q(x)) \to r(x)]$. **(05 Marks)**

4 a. Define the following : i) Well ordering principle
ii) Principle of mathematical induction. (04 Marks)

b. Establish the following by mathematical induction :
$$\sum_{t=1}^{n} i\,(2^i) = 2 + (n-1)2^{n+1}.$$ (05 Marks)

c. Find a unique solution for the recurrence relation : $4a_n - 5a_{n-1} = 0, n \geq 1, a_0 = 1$. (05 Marks)

d. Let F_n denote the n^{th} Fibonacci number :
Prove that $\sum_{i=1}^{n} \frac{F_{(i-1)}}{2^i} = 1 - \frac{F_{(n+2)}}{2^n}$. (06 Marks)

PART – B

5 a. Define Cartesian product of two sets. For non–empty sets A, B, C prove that, $A \times (B \cap C) = (A \times B) \cap (A \times C)$. (04 Marks)

b. For each of the following functions, determine whether it is 1 – 1 :
i) $f : Z \to Z, f(x) = 2x + 1$ ii) $f : Z \to Z, f(x) = x^3 - x$. (06 Marks)

c. Let $A = B = C = R$, $f : A \to B$, $f(a) = 2a + 1$; $g : B \to C$, $g(b) = b/2$. Compute gof and show that it is invertible. (05 Marks)

d. Let ΔABC be an equilateral triangle of side 1. Show that if we select 10 points in the interior, there must be at least two points whose distance apart is less than 1/3. (05 Marks)

6 a. For each of the following relations, determine if the relation R is reflexive, symmetric, antisymmetric or transitive :
i) On the set of all lines in the plane, $\ell_1 R \ell_2$ if line ℓ_1 is perpendicular to live ℓ_2
ii) On Z, xRy if x – y is even. (05 Marks)

b. For A = {1, 2, 3, 4}, let R = {(1, 1), (1, 2), (2, 3), (3, 3), (3, 4)} be a relation on A. Draw the digraph of R^2 and find the matrix $M(R^2)$. (05 Marks)

c. Draw the Hasse diagram for all the positive integer division of 72. (05 Marks)

d. Let A = {1, 2, 3, 4, 5, 6} × {1, 2, 3, 4, 5, 6}. Define R on A by $(x_1, y_1)\ R(x_2, y_2)$ if $x_1y_1 = x_2y_2$. Verify that R is an equivalence relation on A. (05 Marks)

7 a. For a group(G1′), prove that it is abelian if $(a, b)^2 = a^2, b^2$ for all $a, b \in G$. (05 Marks)

b. Let $A = \begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$. Verify that (A, A^2, A^3, A^4) form an abelian group under matrix multiplication. (06 Marks)

c. Define a cyclic group. Verify that $(Z_5^*, \cdot)$ is cyclic. Find a generator of this group. Examine if it has any subgroups. (09 Marks)

8 a. Determine whether $(Z, \oplus, \otimes)$ is a ring with the binary operations $x \oplus y = x + y - 7$, $x \otimes y = x + y - 3xy$ for all $x, y \in Z$. (06 Marks)

b. The (5m, m) five times repetition code has encoding function $E : Z_2^m \to Z_2^{5m}$. Decoding with $D : Z_2^{5m} \to Z_2^m$ is done by majority rule. With p = 0.05, what is the probability for the transmission and correct decoding of the signal 110. (06 Marks)

c. What is the minimum distance of a code consisting of the following code words : 001010, 011100, 010111, 011110, 101001? What kind of errors can be detected? (03 Marks)

d. The encoding function $E : Z_2^2 \to Z_2^5$ is given by the generator matrix $G = \begin{pmatrix} 1 & 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 1 & 1 \end{pmatrix}$.
What is the error detection capacity of the code? (05 Marks)

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10CS35

Third Semester B.E. Degree Examination, December 2011
Data Structures with C

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. What is an algorithm? Briefly explain the criteria that an algorithm must satisfy. **(08 Marks)**

b. Write a recursive function to implement binary search. **(08 Marks)**

c. Define 'Big Oh' notation. Show that $3n+2 = O(n)$ is correct. **(04 Marks)**

2 a. Develop a structure to represent planets in the solar system. Each planet has fields for the planets name, its distance from the sun in miles and the number of moons it has. Write a program to read the data for each planet and store. Also print the name of the planet that has the highest number of moons. **(08 Marks)**

b. For the given sparse matrix and its transpose, give the triplet representation using one dimensional array. a is the given sparse matrix, b will be its transpose.

$$a = \begin{bmatrix} 15 & 0 & 0 & 22 & 0 & -15 \\ 0 & 11 & 3 & 0 & 0 & 0 \\ 0 & 0 & 0 & -6 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 91 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 28 & 0 & 0 & 0 \end{bmatrix}$$ **(08 Marks)**

c. Consider two polynomials $A(x) = 2x^{1000} + 1$ and $B(x) = x^4 + 10x^3 + 3x^2 + 1$, show diagrammatically how these two polynomials can be stored in a single 1-D array. Also give its C representation. **(04 Marks)**

3 a. Define stack. Give the C implementation of push and pop functions. Include check for empty and full conditions of stack. **(08 Marks)**

b. Write a C function to evaluate a postfix expression. **(08 Marks)**

c. For the given circular queue shown in Fig.Q2(c), write the values of front and rear in the table after each specified operation is performed. Queue full/empty conditions must be considered. 0 - 7 indicate the array indices. **(04 Marks)**

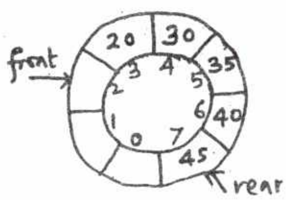

Fig.Q2(c)

Operation	Rear	Front
Insert 0		
Insert 10		
Insert 15		
delete		

4 a. Explain how a chain can be used to implement a queue. Write the functions to insert and delete elements from such a queue. **(08 Marks)**

b. Describe the doubly linked lists with advantages and disadvantages. Write a C function to delete a node from a doubly linked list. ptr is the pointer which points to the node to be deleted. Assume that there are nodes on either side of the node to be deleted. **(08 Marks)**

c. For the given sparse matrix, give the diagrammatic linked representation.

$$a = \begin{bmatrix} 0 & 1 & 2 \\ 3 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

(04 Marks)

PART – B

5 a. With reference to the Fig.Q5(a), answer the following:

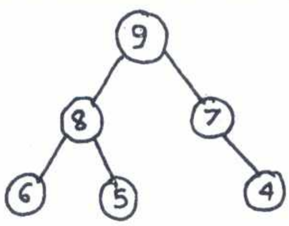

Fig.Q5(a)

i) Is it a binary tree?
ii) Is it a complete tree?
iii) Give the preorder traversal.
iv) Give the inorder traversal.
v) Give the postorder traversal
vi) Give the list notation (using pairs of round brackets).
vii) Where will be the left child of node 4 pointing to, if it is converted to a threaded b-tree?
viii) Is it a max heap?

(08 Marks)

b. Write the following C functions for
i) Counting the number of leaf nodes in a b-tree.
ii) Finding the inorder successor of a node in a threaded b-tree. **(08 Marks)**

c. Show that for any non-empty b-tree T, if n_0 is the number of leaf nodes and n_2 is the number of nodes of degree 2, then $n_0 = n_2 + 1$. **(04 Marks)**

6 a. Explain the following with an example:
i) Forest ii) Graph iii) Winner tree. **(08 Marks)**

b. Describe the binary search tree with an example. Write a iterative function to search for a key value in a binary search tree. **(08 Marks)**

c. Construct the b-tree from the given traversals:

Preorder : ABDCEF
Inorder : BDAEFC
Postorder : DBFECA

(04 Marks)

7 a. Briefly explain the following with examples:
i) HBLT ii) WBLT **(08 Marks)**

b. What is binomial heap? Explain the steps involved in the deletion of min element from a binomial heap. **(08 Marks)**

c. Define Fibonacci heap. Briefly explain the different types. **(04 Marks)**

8 a. Describe the following with an example eah:
i) height balanced trees ii) Optimal bst **(08 Marks)**

b. Explain the Red-black tree. State its properties. **(08 Marks)**

c. What is a splay tree? Briefly explain the different types of splay trees. **(04 Marks)**

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10CS36

Third Semester B.E. Degree Examination, December 2011
Object Oriented Programming with C++

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting atleast TWO questions from each part.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

PART – A

1 a. Explain the terms encapsulation, polymorphism and inheritance in object oriented programming. **(06 Marks)**
b. What is function overloading? Write a C++ program to define three overloaded functions area ( ), to find area of rectangle area of rectangular box and area of circle. **(08 Marks)**
c. With an example explain the concept of inline functions. **(06 Marks)**

2 a. Differentiate between class and object. Write a C++ program to define a class called TIME with hour, minute and second as data members and read( ), display( ) and add( ) as member functions. **(10 Marks)**
b. What is a constructor? What are its characteristics? Define a suitable parameterized constructor with default values for the class box with data members length, breadth and height as data members. **(10 Marks)**

3 a. What is a friend function? Explain the need of friend functions in C++. **(05 Marks)**
b. Write a C++ program to swap two integer and floating–point numbers, using a function template. **(05 Marks)**
c. What is operator overloading? Write a C++ program to add two complex numbers by overloading the + operator. Also overload >> and << operators for reading and displaying the complex numbers. **(10 Marks)**

4 a. Explain the visibility of the base class members, for the access specifiers : private, protected and public while creating the derived classes. **(06 Marks)**
b. Differentiate between private members and protected members. Write a C++ program to illustrate protected members in the base class. **(07 Marks)**
c. With an example explain multiple in heritance. **(07 Marks)**

PART – B

5 a. With an example explain the order of invocation of constructors and destructors and passing arguments to base class contractors in multilevel inheritance. **(10 Marks)**
b. What are the ambiguities that arise in multiple inheritance? How to overcome this? Explain with examples. **(10 Marks)**

6 a. What is a virtual function? Explain with a suitable example. (06 Marks)

b. Write a C++ program to create a base class called shape. Use this class to store two double type values that could be used to compute the area of figures. Derive two specific classes called triangle and rectangle from the base shape. Add to the base class, a member function get_data( ) to initialize base class data members and another member function display_area( ) to compute and display the area of figures. Make display_area( ) as a virtual function and redefine this function in derived classes to suit their requirements. (08 Marks)

c. Write a C++ program to create base class called number with an integer data member and a member function to set the value for this data member. Derive three classes from this base class called hexadecimal, decimal and octal. Include a member function show( ) in all these three derived classes to display the value of the base class data member in hexadecimal, decimal and octal respectively. Use the concept of pure virtual functions. (06 Marks)

7 a. With an example and general syntax explain the member functions :
i) width( )
ii) precision
iii) fill( ). (06 Marks)

b. Write a C++ program to define a class called phonebook with data members name, area code, prefix and number and the member functions readdata( ) which reads the values of the data members from the keyboard and writedata( ) which displays the values of the data members. Enter the data for at least 5 phone numbers and store details in a binary file phone and read the stored details and display on the screen. (09 Marks)

c. Briefly explain the member functions : (05 Marks)
setf( ) and unsetf( ).

8 a. What is exception handling? Briefly explain the facilities in C++ for exception handling. (10 Marks)

b. Briefly explain the use of containers, vectors, lists and maps in STL. (10 Marks)

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MATDIP301

Third Semester B.E. Degree Examination, December 2011

Advanced Mathematics - I

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions.***

1 a. Express $\frac{1}{(2+i)^2}-\frac{1}{(2-i)^2}$ in the form $a+ib$. **(06 Marks)**

b. Find the modulus and amplitude of $\frac{(3-\sqrt{2}i)^2}{1+2i}$. **(07 Marks)**

c. Find the real part of $\frac{1}{1+\cos\theta+i\sin\theta}$. **(07 Marks)**

2 a. Find the n^{th} derivative of $\cos x\cos 2x\cos 3x$. **(06 Marks)**

b. If $y=(\sin^{-1}x)^2$, show that $(1-x^2)y_{n+2}-(2n+1)xy_{n+1}-n^2y_n=0$. **(07 Marks)**

c. Find the nth derivative of $\frac{x+2}{x+1}+\log\left(\frac{x+2}{x+1}\right)$. **(07 Marks)**

3 a. State and prove Euler's theorem. **(06 Marks)**

b. Given $u=\sin\left(\frac{x}{y}\right)$, $x=e^t$, $y=t^2$, find $\frac{du}{dt}$ as a function of t. **(07 Marks)**

c. If $x=r\cos\theta$, $y=r\sin\theta$, find $\frac{\partial(x,y)}{\partial(r,\theta)}$ and $\frac{\partial(r,\theta)}{\partial(x,y)}$. **(07 Marks)**

4 a. Find the angle of intersection of the curves $r=a(1+\cos\theta)$ and $r=b(1-\cos\theta)$. **(06 Marks)**

b. Find the pedal equation of the curve $\frac{2a}{r}=1-\cos\theta$. **(07 Marks)**

c. Expand $e^{\sin x}$ by Maclaurin's series upto the term containing x^4. **(07 Marks)**

5 a. Obtain the reduction formula for $I_n=\int_0^{\pi/2}\sin^n x\,dx$ where n is a positive integer. **(06 Marks)**

b. Evaluate : $\int_1^5\int_1^{x^2}x(x^2+y^2)dx\,dy$. **(07 Marks)**

c. Evaluate : $\int_0^1\int_0^2\int_1^2 x^2yz\,dx\,dy\,dz$. **(07 Marks)**

6 a. Prove that $\beta(m,n)=\dfrac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$. **(06 Marks)**

b. Show that $\Gamma(n)=\int_0^1\left(\log\dfrac{1}{x}\right)^{n-1}dx$. **(07 Marks)**

c. Express $\int_0^{\pi/2}\sqrt{\tan\theta}\,d\theta$ in terms of Gamma function. **(07 Marks)**

7 a. Solve : $\dfrac{dy}{dx}=\dfrac{x(2\log x+1)}{\sin y+y\cos y}$. **(06 Marks)**

b. Solve : $(1+e^{x/y})dx+e^{x/y}\left(1-\dfrac{x}{y}\right)dy=0$. **(07 Marks)**

c. Solve : $(x^2-ay)dx=(ax-y^2)dy$. **(07 Marks)**

8 a. Solve : $\dfrac{d^4y}{dx^4}+8\dfrac{d^2y}{dx^2}+16y=0$. **(06 Marks)**

b. Solve : $(D-2)^2y=8(e^{2x}+\sin 2x)$. **(07 Marks)**

c. Solve : $(D^3+4D)y=\sin 2x$. **(07 Marks)**

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