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10MAT31

Third Semester B.E. Degree Examination, Dec.2015/Jan.2016
Engineering Mathematics – III

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. For the function :

$$f(x)=\begin{cases} x & \text{in} \quad 0<x<\pi \\ x-2\pi & \text{in} \quad \pi<x<2\pi \end{cases}$$

Find the Fourier series expansion and hence deduce the result $\frac{\pi}{4}=1-\frac{1}{3}+\frac{1}{5}$- - - - - - - -. **(07 Marks)**

b. Obtain the half range Fourier cosine series of the function $f(x) = x(\ell - x)$ in $0 \le x \le \ell$. **(06 Marks)**

c. Find the constant term and first harmonic term in the Fourier expansion of y from the following table :

x	0	1	2	3	4	5
y	9	18	24	28	26	20

(07 Marks)

2 a. Find the Fourier transform of the function :

$$f(x)=\begin{cases} 1 & \text{for} \quad |x|\le a \\ 0 & \text{for} \quad |x|>a \end{cases}$$ and hence evaluate : $\int_0^\infty \frac{\sin x}{x}dx$. **(07 Marks)**

b. Obtain the Fourier sine transform of $f(x) = e^{-|x|}$ and hence evaluate $\int_0^\infty \frac{x\sin mx}{1+x^2}dx, m>0$. **(06 Marks)**

c. Solve the integral equation : $\int_0^\infty f(x)\cos px\,dx = \begin{cases} 1-p, & 0\le p\le 1 \\ 0, & p>1 \end{cases}$ and hence deduce the value of $\int_0^\infty \frac{\sin^2 t}{t^2}dt$. **(07 Marks)**

3 a. Obtain the various possible solutions of the two dimensional Laplace's equation $u_{xx} + u_{yy} = 0$ by the method of separation of variables. **(07 Marks)**

b. A string is stretched and fastened to two points 'ℓ' apart. Motion is started by displacing the string in the form $y = a\sin\left(\frac{\pi x}{\ell}\right)$ from which it is released at time t = 0. Show that the displacement of any point at a distance 'x' from one end at time 't' is given by $y(x, t) = a \sin\left(\frac{\pi x}{\ell}\right)\cos\left(\frac{\pi ct}{\ell}\right)$. **(06 Marks)**

c. Obtain the D' Alembert's solution of the wave equation $u_{tt} = c^2 u_{xx}$ subject to the conditions $u(x, 0) = f(x)$ and $\frac{\partial u}{\partial t}(x,0) = a$. **(07 Marks)**

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.

4 a. For the following data fit an exponential curve of the form $y = a\,e^{bx}$ by the method of least squares :

x	5	6	7	8	9	10
y	133	55	23	7	2	2

(07 Marks)

b. Solve the following LPP graphically :
Minimize $Z = 20x + 10y$
Subject to the constraints : $x + 2y \le 40$
$3x + y \ge 30$
$4x + 3y \ge 60$
$x \ge 0$ and $y \ge 0$. **(06 Marks)**

c. Using Simplex method, solve the following LPP :
Maximize : $Z = 2x + 4y$
Subject to the constraints $3x + y \le 22$
$2x + 3y \le 24$
$x \ge 0$ and $y \ge 0$. **(07 Marks)**

PART – B

5 a. Using the Regula – Falsi method to find the fourth root of 12 correct to three decimal places. **(07 Marks)**

b. Apply Gauss – Seidal method, to solve the following of equations correct to three decimal places :
$6x + 15y + 2z = 72$
$x + y + 54z = 110$
$27x + 6y - z = 8.5$
(carry out 3 iterations). **(06 Marks)**

c. Using Rayleigh power method, determine the largest eigen value and the corresponding eigen vector, of the matrix A in six iterations. Choose $[1\ 1\ 1]^T$ as the initial eigen vector :

$$A = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}.$$ **(07 Marks)**

6 a. Using suitable interpolation formulae, find y(38) and y(85) for the following data :

x	40	50	60	70	80	90
y	184	204	226	250	276	304

(07 Marks)

b. If $y(0) = -12$, $y(1) = 0$, $y(3) = 6$ and $y(4) = 12$, find the Lagrange's interpolation polynomial and estimate y at $x = 2$. **(06 Marks)**

c. By applying Weddle's rule, evaluate : $\int_0^1 \frac{x\,dx}{1+x^2}$ by considering seven ordinates. Hence find the value of $\log_e^2$. **(07 Marks)**

7 a. Using finite difference equation, solve $\frac{\partial^2 u}{\partial t^2} = 4\frac{\partial^2 u}{\partial x^2}$ subject to $u(0, t) = u(4, t) = 0$, $u_t(x, 0) = 0$ and $u(x, 0) = x(4 - x)$ upto four time steps. Choose $h = 1$ and $k = 0.5$. **(07 Marks)**

b. Solve the equation $u_t = u_{xx}$ subject to the conditions $u(0, t) = 0$, $u(1, t) = 0$, $u(x, 0) = \sin(\pi x)$ for $0 \le t \le 0.1$ by taking $h = 0.2$. **(06 Marks)**

c. Solve the elliptic equation $u_{xx} + u_{yy} = 0$ for the following square mesh with boundary values as shown. Find the first iterative values of $u_i (i = 1 - 9)$ to the nearest integer. **(07 Marks)**

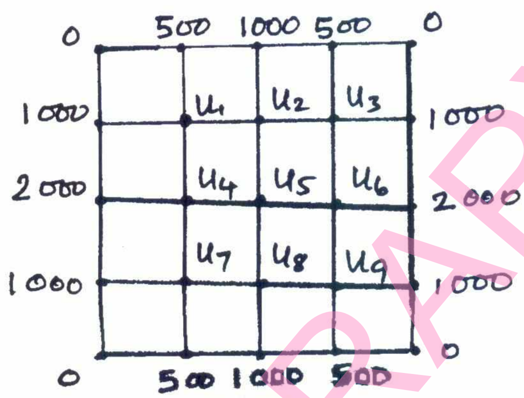

Fig.Q7(c)

8 a. Find the z – transform of $2n + \sin(n\pi/4) + 1$. **(07 Marks)**

b. Obtain the inverse z – transform of $\frac{2z^2 + 3z}{(z+2)(z-4)}$. **(06 Marks)**

c. Using z – transform, solve the following difference equation :
$u_{n+2} + 2u_{n+1} + u_n = n$ with $u_0 = u_1 = 0$. **(07 Marks)**

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10CS32

Third Semester B.E. Degree Examination, Dec.2015/Jan.2016

Electronic Circuits

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. What is an operating point? How to choose an operating point for faithful amplification of an input signal? **(06 Marks)**

b. Derive the expressions for the operation point in voltage divider bias configuration. Use accurate method for analysis. **(08 Marks)**

c. For the circuit shown in Fig.Q1(c), calculate I_B, I_C, V_{CE}, V_C, V_B and V_E. Assume $\beta = 100$ and $V_{BE} = 0.7V$ **(06 Marks)**

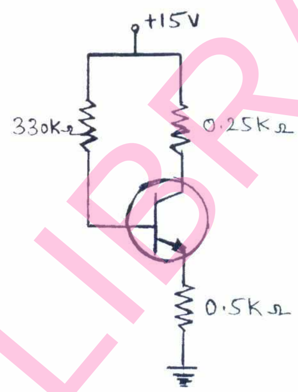

Fig. Q1(c)

2 a. Bring out the difference between Bipolar Junction Transistors and Field effect Transistors **(05 Marks)**

b. Explain the construction and working of N – channel depletion mode MOSFET along with its characteristic curves. **(10 Marks)**

c. List and briefly explain some applications of field effect transistors. **(05 Marks)**

3 a. Define the following terms with reference to photo sensors **(08 Marks)**

i) Responsivity

ii) Response time

iii) Noise equivalent power

iv) Spectral Response.

b. Explain the working of a photo diode along with its VI characteristics. **(07 Marks)**

c. Write a short note on Liquid crystal displays. **(05 Marks)**

4 a. With a neat diagram, explain the h – parameter model for common – emitter transistor configuration. **(08 Marks)**

b. Explain bandwidth with reference to an amplifier. What are the factors affecting it? **(05 Marks)**

c. Explain the importance of cascaded connection of amplifiers, with a diagram. **(07 Marks)**

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PART – B

5 a. Classify large signal amplifier and make a suitable comparison. **(10 Marks)**

b. With a block diagram explain the working of Negative feedback amplifiers. How is gain affected in these amplifiers? **(10 Marks)**

6 a. Explain Barkhausen criterion. **(06 Marks)**

b. Determine the gain and phase shift for an oscillator circuit with a 1% positive feedback and a two stage CE configuration. **(04 Marks)**

c. Explain the working of an Astable Multivibrator with necessary diagrams and expression for frequency of oscillations. **(10 Marks)**

7 a. What is voltage Regulation? With a neat circuit diagram explain the working of a Buck Regulator. **(12 Marks)**

b. Compare linear power supplies with switched mode power supplies. **(03 Marks)**

c. A regulated power supply provides a ripple rejection of - 80dB. If the ripple voltage in an unregulated input were 2V, determine the output ripple. **(05 Marks)**

8 a. Discuss any five performance parameters of an operational Amplifier. **(05 Marks)**

b. Explain with neat diagrams, the working of low-pass and high pass filters using operational amplifiers. **(08 Marks)**

c. For the relaxation oscillator circuit in Fig.Q8(c), determine the peak – to – peak amplitude and frequency of the square wave output given that saturation output voltage of op-amp is ± 12.5V at power supply voltages of ±15V. **(07 Marks)**

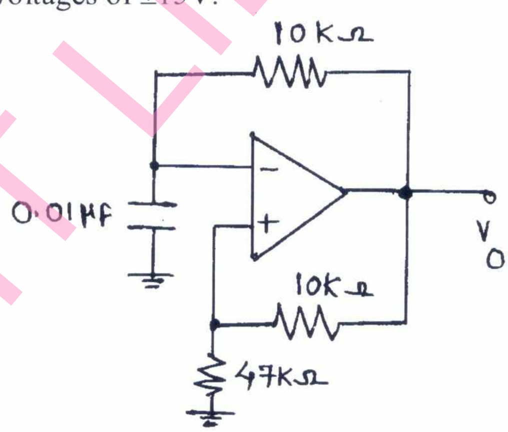

Fig. Q8(c)

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10CS33

Third Semester B.E. Degree Examination, Dec.2015/Jan.2016
Logic Design

Time: 3 hrs. Max. Marks:100

Note: ***Answer any 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. What is Logic gate? State and prove De Morgan's theorems. **(07 Marks)**

b. Describe positive and negative logic. Prove "positive OR" logic equal to "Negative AND" logic. **(05 Marks)**

c. Implement the following function by using : i) Nand gates only ii) NOR gates only.
$Y = \overline{((A+B).C)}.D$ **(08 Marks)**

2 a. Find the minimal SOP and minimal POS of the following Boolean function using K - Map.
$f(a, b, c, d) = \Sigma_m (6, 7, 9, 10, 13) + d(1, 4, 5, 11)$. **(08 Marks)**

b. Using Q.M method simplify the following expression and realize it by using Nand logic only. $f(a, b, c, d) = \Sigma(0, 3, 5, 6, 7, 11, 14)$. **(10 Marks)**

c. Write a note on Static Hazard. **(02 Marks)**

3 a. Construct 8:1 multiplexer using only 2:1 multiplexer. **(06 Marks)**

b. Mention the three differences between decoder and demultiplexer. **(03 Marks)**

c. Write the four comparisons between PLA and PAL. **(04 Marks)**

d. Implement the following function using PLA : **(07 Marks)**
$A(x, y, z) = \Sigma m (1, 2, 4, 6)$; $B(x, y, z) = \Sigma m (0, 1, 6, 7)$; $C(x, y, z) = \Sigma m (2, 6)$.

4 a. With logic diagram and truth table, explain the working of master slave (J, K) flip flop. **(06 Marks)**

b. Draw the logic truth table and timing diagram of positive edge triggered D – flip flop. **(06 Marks)**

c. Write the verilog code for positive edge triggered J.K flip flop. **(03 Marks)**

d. With neat diagram, explain the working principles of Switch De bouncer circuit. **(05 Marks)**

PART - B

5 a. Write a note on classifications of Registers. **(04 Marks)**

b. With neat diagram and timing diagram, explain the working of Serial in – Serial out register. For explanation construct 4 bit register using J.K flip flops. **(10 Marks)**

c. Write a Verilog code for : i) Switched tail counter ii) Shift registers of 5 bits constructed using D-flip flops. **(06 Marks)**

6 a. Write the comparison between Synchronous and Asynchronous counter. **(04 Marks)**

b. Design : i) a divide by 78 counter using 7493 and 7492 IC ii) modulo 120 counter using 7490 and 7492 IC. **(08 Marks)**

c. Design a mod 6 counter using J.K flip flops and K – map simplification method. **(08 Marks)**

7 a. Explain the difference between Mealy model and Moore model. **(05 Marks)**

b. Design a Mealy type sequence detector to detect a serial i/p sequence of 101. **(10 Marks)**

c. How does state transition diagram of a Moore machine differ from Melay machine? **(05 Marks)**

8 a. Explain with neat diagram, successive approximation A/D converter. **(06 Marks)**

b. Explain with neat diagram, counter method of A/D conversion. **(06 Marks)**

c. Write short notes on :
i) Binary loader ii) Differences between D/A and A/D converters. **(08 Marks)**

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10CS34

Third Semester B.E. Degree Examination, Dec.2015/Jan.2016

Discrete Mathematical Structures

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Define symmetric difference of two sets. Also prove by using Venn diagram for any three sets A, B, C $(A\Delta B)\Delta C = A\Delta(B\Delta C)$ **(06 Marks)**

b. (i) Write the dual statement for the set theoretic results,
$u: U = (A\cap B)\cup(A\cap\overline{B})\cup(\overline{A}\cap B)\cup(\overline{A}\cap\overline{B})$

(ii) Using the laws of set theory simplify : $\overline{\overline{(A\cup B)\cap C}\cup\overline{B}}$. **(03 Marks)**

c. A student visits an arcade each day after school and plays one game of either Laser man, Millipede or space conquerors. In how many ways can he play one game each day so that he plays each of the three types at least once during a given school week? (Monday through Friday). **(06 Marks)**

d. An integer is selected at random from 3 through 17 inclusive. If A is the event that a number divisible by 3 is choosen and B is the event that the choosen number exceeds 10. Determine $\Pr(A)$, $\Pr(B)$, $\Pr(A\cap B)$, $\Pr(A\cup B)$. **(05 Marks)**

2 a. Prove the following logical equivalence without using truth table. $[\neg p\wedge(\neg q\wedge r)]\vee(q\wedge r)\vee(p\wedge r)\Leftrightarrow r$. **(06 Marks)**

b. Define Tautology. Examine whether the compound proposition $[(p\vee q)\to r]\leftrightarrow[\neg r\to\neg(p\vee q)]$ is a Tautology. **(07 Marks)**

c. Establish the validity of the argument:

$$\begin{array}{l} p\to q \\ q\to(r\wedge s) \\ \neg r\vee(\neg t\vee u) \\ p\wedge t \\ \hline \therefore u \end{array}$$

(07 Marks)

3 a. Write down the converse, inverse and contra positive of,
$"\forall x[x^2+4x-21>0]\to[(x>3)\vee(x<-7)]$ **(03 Marks)**

b. Let $p(x): x^2-7x+10=0$, $q(x): x^2-2x-3=0$, $r(x): x<0$. Determine the truth or falsity of the statement for which the universe contains only the integers 2 and 5. If a statement is false, provide a counter example.
i) $\forall x[p(x)\to\neg r(x)]$ ii) $\forall x[q(x)\to r(x)]$ iii) $\exists x[q(x)\to r(x)]$
iv) $\exists x[p(x)\to r(x)]$ **(05 Marks)**

c. Determine the truth value of each of the following quantified statements for the set of all non-zero integers:
i) $\exists x,\exists y[xy=1]$ ii) $\forall x,\exists y[xy=1]$ iii) $\exists x,\exists y[(2x+y=5)\wedge(x-3y=-8)]$
iv) $\exists x,\exists y[(3x-y=17)\wedge(2x+4y=3)]$ v) $\exists x,\forall y[xy=1]$. **(05 Marks)**

d. Establish the validity of the following argument,

$$\begin{array}{l} \forall x,[p(x)\vee q(x)] \\ \exists x,[\neg p(x)] \\ \forall x,[\neg q(x)\vee r(x)] \\ \forall x,[s(x)\to\neg r(x)] \\ \hline \therefore \exists x\neg s(x) \end{array}$$

(07 Marks)

4 a. Define the well-ordering principle. By using mathematical induction prove that,
$$\frac{1}{2.5}+\frac{1}{5.8}+\frac{1}{7.11}+\dots+\frac{1}{(3n-1)(3n+2)}=\frac{n}{6n+4}$$ **(07 Marks)**

b. If $F_0, F_1, F_2 \ldots\ldots$ are Fibonacci numbers, prove that $\sum_{i=0}^{n} F_i^2 = F_n \times F_{n+1}$. **(07 Marks)**

c. The Ackermann's numbers $A_{m,n}$ are defined recursively for $m, n \in N$ as follows:

$A_{0,n} = n+1$ for $n \geq 0$

$A_{m,0} = A_{m-1,1}$ for m>0

$A_{m,n} = A_{m-1,P}$ where $P = A_{m,n-1}$ for m, n>0. Prove that $A_{1,n} = n+2$ for all $n \in N$. **(06 Marks)**

PART – B

5 a. Define equivalence relation and equivalence class with one example. **(06 Marks)**

b. Let A={1, 2, 3, 4, 6}, R be a relation on A defined by aRb if and only if 'a' is a multiple of 'b'. Represent the relation R as a matrix and draw its digraph. **(06 Marks)**

c. Let $A = \{1, 2, 3, 4, 5\}$, A relation R on $A \times A$ by $(x_1, y_1)R(x_2, y_2)$ if and only if $x_1 + y_1 = x_2 + y_2$. Determine the partition of $A \times A$ induced by R. **(04 Marks)**

d. Consider the Hasse diagram of a POSET (A,R) given below:

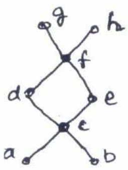

Fig. Q5 (d)

If $B = \{c, d, e\}$, find (if they exist)
(i) all upper bounds of B (ii) all lower bounds of B
(iii) the least upper bound of B (iv) the greatest lower bound of B. **(04 Marks)**

6 a. Let f: $R \rightarrow R$ be defined by $f(x) = \begin{cases} 3x-5 & \text{for } x > 0 \\ -3x+1 & \text{for } x \leq 0 \end{cases}$ find $f^1(3)$, $f^1(-6)$, $f^{-1}([-5,5])$ and $f^{-1}([-6,5])$. **(05 Marks)**

b. If f is a real valued function defined by $f(x) = x^2 + 1 \; \forall x \in R$. Find the images of the following: (i) $A_1 = \{2,3\}$ (ii) $A_2 = \{-2, 0, 3\}$ (iii) $A_3 = \{0,1\}$ (iv) $A_4 = \{-6, 3\}$ **(05 Marks)**

c. State the pigeon hole principle. Prove that in any set of 29 persons at least five persons must have been born on the same day of the week. **(04 Marks)**

d. What is Invertible function? For the invertible functions $f: A \rightarrow B$ and $g: B \rightarrow C$, prove that $(g \circ f)^{-1} = f^{-1} \circ g^{-1}$. **(06 Marks)**

7 a. Define subgroup of a group. Prove that H is a subgroup of a group G if and only if for all $a, b \in H$, $ab^{-1} \in H$. **(06 Marks)**

b. For a group G, prove that the function $f: G \rightarrow G$ defined by $f(a) = a^{-1}$ is an isomorphism if and only if G is abelian. **(04 Marks)**

c. State and prove Lagrange's theorem. **(05 Marks)**

d. A binary symmetric channel has probability P = 0.05 of incorrect transmission. If the word C = 011011101 is transmitted, what is the probability that, i) a double error occurs ii) a triple error occurs iii) three errors occur no two of them consecutive? **(05 Marks)**

8 a. Find all integers K and m for which $(z, \oplus, \odot)$ is a ring under the binary operations $x \oplus y = x + y - K$, $x \odot y = x + y - mxy$. **(05 Marks)**

b. What is an integral domain? Prove that every field is an integral domain. **(05 Marks)**

c. Let C be a group code in Z_2^n. If $r \in Z_2^n$ is a received word and r is decoded as the code word. C^*, then prove that $d(C^*, r) \leq d(C, r)$ for all $c \in C$. **(04 Marks)**

d. Prove that in Z_n, [a] is a unit if and only if gcd (a, n) = 1 and find all the units in Z_{12}. **(06 Marks)**

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10CS35

Third Semester B.E. Degree Examination, Dec.2015/Jan.2016
Data Structures with C

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Explain the functions supported by C to carry out dynamic memory allocation with example. **(06 Marks)**

b. What is recursion? What are the various types of recursion? Write a recursive function to implement binary search. **(07 Marks)**

c. Define the term "Space and time complexity". Determine the time complexity of an iterative and recursive functions that adds n elements of an array using tabular method. **(07 Marks)**

2 a. Write a note on dynamically allocated array's with example. **(06 Marks)**

b. How would you represent two sparse polynomials using array of structures and also write a function to add two polynomials and give the analysis of the function. **(10 Marks)**

c. For the given sparse matrix A and its transpose, give the triplet representation 'A' is the given sparse matrix and 'B' will be its transpose.

$$\text{Sparse matrix } A = \begin{bmatrix} 25 & 0 & 0 & 11 & 0 & -10 \\ 0 & 12 & 3 & 0 & 0 & 0 \\ 0 & 0 & 0 & 6 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 81 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -18 & 0 & 0 & 0 \end{bmatrix}$$ **(04 Marks)**

3 a. Define stack. Implement push and pop functions for stacks using arrays. **(05 Marks)**

b. Write the postfix form of the following expressions using stack:

i) $A\$B * C - D + E / F / (G + H)$

ii) $A - B / (C * D \$ E)$ **(06 Marks)**

c. What is the advantage of circular queue over linear queue? Write insert and delete functions for circular implementation of queues. **(05 Marks)**

d. Evaluate the following postfix expression 6 2 3 + - 3 8 2 / + * 2 $ 3 + using stack. **(04 Marks)**

4 a. Write C functions to implement the insert and delete operations on a queue using linked list. **(08 Marks)**

b. With the node structure show how would you store the given polynomials a and b in linked list? Write a C function for adding 2 polynomials using linked lists. **(08 Marks)**

c. Write a note on doubly linked list. How is it different from single linked list? **(04 Marks)**

PART – B

5 a. What is binary tree? State its properties. How it is represented using array and linked list? Give example. **(08 Marks)**

b. Show the binary tree with the arithmetic expression $A / B * C * D + E$. Give the algorithm for inorder, preorder, postorder traversals and show the result of these traversals. **(08 Marks)**

c. What is heap? Explain different types of heap. **(04 Marks)**

6 a. Define binary search tree. Draw the binary search tree for the following input 14, 15, 4, 9, 7, 18, 3, 5, 16, 4, 20, 17, 9, 14, 5 **(07 Marks)**

b. Construct a binary tree having the following sequences:
   i) Preorder seq ABCDEFGHI
   ii) Inorder seq BCAEDGHFI **(05 Marks)**

c. Write a iterative search routine for a binary search tree. **(05 Marks)**

d. Define the following terms:
   i) Forests
   ii) Graphs
   iii) Winner trees. **(03 Marks)**

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

b. Write short notes on:
   i) Priority queues ii) Binomial heaps iii) Priority heaps iv) Fibonacci heaps. **(12 Marks)**

8 Write short notes on:

a. AVL trees.

b. Red-black trees.

c. Optimal binary search trees.

d. Splay trees. **(20 Marks)**

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Third Semester B.E. Degree Examination, Dec.2015/Jan.2016
Object Oriented Programming with C++

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. State the important features of object oriented programming. Compare object oriented system with procedure oriented system. **(08 Marks)**

b. What is function overloading? Illustrate function overloading through swap function which swaps two integer, two double and two character data. **(08 Marks)**

c. Explain the working of an inline function with example **(04 Marks)**

2 a. Define the term class and objects. Write a C++ program to define a class complex with real and imaginary as data members and get_data( ), add( ) and display_Data( ) as member function to read, add and display complex object. **(08 Marks)**

b. Explain with example different types of constructors. **(08 Marks)**

c. Explain with an example the role of static data member in a class to count the number of object created in a program. **(04 Marks)**

3 a. Explain how "new" and "delete" operator manages memory allocation/de-allocation dynamically. **(08 Marks)**

b. What are friend functions? Why is it required? Explain with the help of a suitable example. **(06 Marks)**

c. Write a C++ program to arrange a set of integers and floating point values in ascending order by using template functions. **(06 Marks)**

4 a. What is inheritance? Explain with example different types of inheritance in C++. **(10 Marks)**

b. With an example, explain the effect of private, protected and public access specifier. When a base class is inherited by a derived class? **(10 Marks)**

PART – B

5 a. With the illustration code, explain how the constructors and destructors are involved when a derived class object is created. **(10 Marks)**

b. What is the ambiguity that might arise in multiple inheritances? How to overcome this? Explain with an example. **(06 Marks)**

c. Explain methods of restoring the original access specification of a base class members when it is inherited as private. **(04 Marks)**

6 a. What is virtual function? Explain with an example. How virtual function can be used to implement the runtime polymorphism? **(08 Marks)**

b. Explain with an example pure virtual function. **(06 Marks)**

c. Explain how virtual functions are hierarchical with an example. **(06 Marks)**

7 a. What are various IOStreams in C++? Give the stream class hierarchy. **(10 Marks)**

b. Describe the use of following manipulators :
i) setw( ) ii) setfill( ) iii) setprecision( ) iv) setioflags( ) v) resetioflags( ). **(10 Marks)**

8 a. What is exception handling? Explain with an example how exception is handled in C++. **(10 Marks)**

b. What are standard template library? List and explain any five member function from vectors and lists class in STL. **(10 Marks)**

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MATDIP301

Third Semester B.E. Degree Examination, Dec.2015/Jan.2016

Advanced Mathematics – I

Time: 3 hrs. Max. Marks:100

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

1 a. Express the following in the form a + ib, $\frac{3}{1+i}-\frac{1}{2-i}+\frac{1}{1-i}$ and also find the conjugate. **(06 Marks)**

b. Show that $(a+ib)^n+(a-ib)^n=2(a^2+b^2)^{n/2}\cos(n\tan^{-1}(b/a))$. **(07 Marks)**

c. Find the fourth roots of $1-i\sqrt{3}$ and represent them on an argand plane. **(07 Marks)**

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

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

c. Find the n^{th} derivative of $\frac{x}{(x-1)(2x+3)}$. **(07 Marks)**

3 a. Find the angle between the radius vector and the tangent to the curve $r=a(1-\cos\theta)$ at the point $\theta=\frac{\pi}{3}$. **(06 Marks)**

b. Find the pedal equation to the curve $r=a(1+\cos\theta)$. **(07 Marks)**

c. Obtain the Maclaurin's series expansion of the function $e^x \sin x$. **(07 Marks)**

4 a. If $u=e^{x^3+y^3}$, then prove that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=3u\log u$. **(06 Marks)**

b. If $u=f\left(\frac{x}{y},\frac{y}{z},\frac{z}{x}\right)$, prove that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}+z\frac{\partial u}{\partial z}=0$. **(07 Marks)**

c. If $u=x^2+y^2+z^2$, $v=xy+yz+zx$, $w=x+y+z$, find $J\left(\frac{u,v,w}{x,y,z}\right)$. **(07 Marks)**

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

b. Evaluate : $\int_0^{2a}\int_0^{\sqrt{2ax-x^2}} xy\,dy\,dx$. **(07 Marks)**

c. Evaluate : $\int_0^1\int_0^1\int_0^1 (x+y+z)\,dx\,dy\,dz$. **(07 Marks)**

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, will be treated as malpractice.

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

b. Evaluate: $\displaystyle\int_0^4 x^{3/2}(4-x)^{5/2}\,dx$. **(07 Marks)**

c. Evaluate: $\displaystyle\int_0^\infty x^6 e^{-3x}\,dx$. **(07 Marks)**

7 a. Solve: $\dfrac{dy}{dx}+x\sin 2y=x^3\cos^2 y$. **(06 Marks)**

b. Solve: $(e^y+y\cos xy)dx+(xe^y+x\cos xy)dy=0$. **(07 Marks)**

c. Solve: $x^2ydx-(x^3+y^3)dy=0$. **(07 Marks)**

8 a. Solve: $\dfrac{d^3y}{dx^3}-6\dfrac{d^2y}{dx^2}+11\dfrac{dy}{dx}-6y=0$. **(06 Marks)**

b. Solve : $(D^2-4)y=e^x+\sin 2x$. **(07 Marks)**

c. Solve : $(D^2+D+1)y=1+x+x^2$. **(07 Marks)**

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