

Total No. of pages. 02

THIRD SEMESTER

END SEMESTER EXAMINATION

MC-201 DISCRETE MATHEMATICS

Roll No.....

B.TECH (MC)

NOVEMBER 2016

Time: 3 Hours

Maximum Marks: 50

Note: Attempt ALL by selecting any two parts from each.

All questions carry equal marks.

Q1(a) Let (A, R) and (B, R') be posets. Then show that $(A \times B, R'')$ is a poset with partial order R'' defined by

$(a, b) R'' (a', b') \text{ iff } aRa' \text{ in } A \text{ and } bRb' \text{ in } B$

(b) Use mathematical induction, show that $5^n - 1$ is divisible by 4.

(c) Determine the number of four digit decimal numbers if

(i) Repetition of digits is not allowed

(ii) 0 is not the leading digit in any of the four digit number and repetition of digits is not allowed.

Q2(a) Let the following statements be given. p is "Andy is hungry", q is "The refrigerator is empty" and r is "Andy is mad".

(i) Use connectives to rewrite the following statement "If Andy is hungry and refrigerator is empty then Andy is mad".

(ii) Construct the truth table for the above statement.

(iii) Suppose that the above statement is true and suppose also that Andy is not mad and refrigerator is empty. Is Andy hungry? Explain how to justify using the truth table.

(b) The domain of the following predicate is the set of plants.

$P(x)$ = "x is poisonous" and $Q(x)$ = "Jeff has eaten x"

Translate the following into predicate logic.

(i) Some plants are poisonous.

(ii) Jeff has never eaten a poisonous plant.

(iii) There are some non-poisonous plants that Jeff has never eaten.

(c) Define valid argument. Write the statements in symbolic form and test the validity of the following argument using truth table "If it rains then it will be cold. If it is cold then I shall stay at home. since it rains therefore, I shall stay at home."

Q3(a). Let $A = \{(a + b\sqrt{2}) : a, b \in \mathbb{Z}\}$, show that $(A, +, \cdot)$ with usual addition and multiplication is a commutative ring with identity.

(b) Show that the set of cube roots of unity is an abelian group w.r.t. multiplication.

(c) Solve the recurrence relation $a_n - a_{n-1} - 2a_{n-2} = 2n^2$.

Q4(a). Draw the Hasse diagram to illustrate the following partial ordering:

(i) The set of all subsets of $\{1, 2, 3, 4\}$ having at least two members, partially ordered by \subseteq (i.e. $A \leq B \Leftrightarrow A \subseteq B$).

(ii) The set of all subsets of $\{1, 2, 3, 4\}$ having at most two members, partially ordered by \supseteq (i.e. $A \leq B \Leftrightarrow A \supseteq B$).

(b). Which of the following are Boolean Algebras, where \wedge, \vee are taken as \cap and \cup respectively. Give reason.

(i) The set of all subsets of $\{a, b, c, \dots, z\}$ having at least six elements.

(ii) The set of all subsets X of set of integers such that $n \in X \Rightarrow -n \in X$.

(c) Let (L, \wedge, \vee) be a lattice and $a, b \in L$. Then show that $a \wedge b$ is the glb of a and b and $a \vee b$ is the lub of a and b .

Q5(a) (i) Is there a graph with eight vertices of degree $2, 2, 3, 6, 5, 7, 8, 4$? Give reason.

(ii) Draw all simple graphs with vertices $\{u, v, x, y\}$ and two edges, one of which is (u, v) .

(iii) Find the graph whose adjacency matrix is given below

$$\begin{bmatrix} 1 & 2 & 1 & 2 \\ 2 & 0 & 2 & 1 \\ 1 & 2 & 1 & 0 \\ 2 & 1 & 0 & 0 \end{bmatrix}$$

(b) Prove that a simple graph with at least two vertices has at least two vertices of same degree.

(c) Prove that

(i) In a tree there is only one path between every pair of vertices.

(ii) If in a graph G there is only one path between every pair of vertices then G is a tree.



Total No. of Pages: 2

**III RD SEMESTER
END SEMESTER EXAMINATION**

Roll No. 21K15/MC/13

**B.TECH. [MCE]
(October: - 2015)**

CS-251 DATA STRUCTURES

Time: 3:00 Hours

Max. Marks: 40

Note: Answer any five questions.
Assume suitable missing data, if any.

03-12-2016 20:13

- 1) a) What is recursion? Explain with examples. (4)
b) Give the algorithm/pseudo-code to sort a list of numbers using quick sort. Show the steps of quick sort procedure for sorting the following list of numbers: 14, 26, 64, 56, 20, 3, 44 and 11. (4)
- 2) a) Using examples discuss where the stack data structure will perform better than any other data structure like arrays and linked list. (4)
b) Write a routine/algorithm to find, count and remove duplicate elements in a queue. Give some applications of queues. (4)
- 3) a) The order of the nodes of a Binary Tree in pre-order and inorder traversal are as follows:
PREORDER: A,B,L,M,K,N,P,Q
INORDER: L,B,M,A,N,K,Q,P
Draw the Tree. Also calculate its Post-order traversal. (4)
b) Write an Algorithm/routine to split a singly linked list from the middle. (4)
- 4) a) Write a program in C/C++ to find out the maximum and minimum element in a binary search tree. (4)
b) What is a height balanced tree? Insert the following keys in a Binary search tree so that it is height balanced after each insertion.

~~44, 26, 13, 120, 99, 88, 64~~

(4)

- 5) a) Make a 4-way B-tree by inserting the following keys to an empty 4-way B-tree.

7, 15, 3, 16, 5, 1, 18, 10, 33, 28, 60, 17, 14

(4)

- b) For the following key sequence determine the binary heap obtained when the keys are inserted one by one in the order given into an initially empty heap.

39, 19, 42, 91, 58, 70, 22, 16, 75, 40

(4)

- 6) a) Explain various techniques to represent the Graph in computer memory. Write Depth first Traversal (BFS) algorithm for traversing a graph and also explain it with an example. (4)

- b) Draw a hash table with open addressing and a size of 9. Use the hash function " $k\%9$ ". Insert the keys: 5, 29, 20, 0, 27 and 18 into your table. (4)

7) Write short notes :-

(4x4)

- a) Binary search tree ✓
- b) Threaded Binary Trees ✓
- c) Doubly Circular Linked List ✓
- d) Priority Queues using heaps ✓

Total page: 02

THIRD SEMESTER

END SEMESTER EXAMINATION

MC - 203 MATHEMATICS -III

Time Allowed: 3 Hrs.

Roll No:.....

B.Tech. (MC)

Nov. 2016

Max. Marks: 40

Note: Answer ALL questions selecting any TWO from each question. All questions carry equal marks. Assume missing data if any.

Discuss the convergence or divergence of the following improper integrals. Find the value if it exists.

(i) $\int_2^{\infty} \frac{\cos^2 x}{x^2} dx$

(ii) $\int_1^{\infty} \frac{1 + \sin^4(2x)}{\sqrt{x}} dx$

(b) Show that the function

$$f(z) = \begin{cases} \frac{x^2 y^3 (x + iy)}{x^4 + y^{10}}, & z \neq 0 \\ 0, & z = 0 \end{cases}$$

is not analytic $z = 0$, although Cauchy-Riemann (C-R) equations are satisfied at this point.

(c) If $u(x, y)$ and $v(x, y)$ satisfy Laplace equations and let $S = u_x - v_y$ and $T = u_y + v_x$. Show that S and T satisfy C-R equations.

Determine the analytic function $f(z)$ in terms of z , where

$$u - v = e^{-2xy} \sin(x^2 - y^2) + e^{2xy} \cos(x^2 - y^2).$$

(b) Under the transformation $w = \frac{1}{z}$, find the image of $|z - 2i| = 2$.

(c) Determine the bilinear transformation that maps the points $z = 0, -1, \infty$ respectively into the points $w = -1, -2 - i, i$.

3) Show that $\int_c \frac{e^z}{z} dz = 2\pi i$, $c: |z| = 1$. Hence, show that

$$\int_0^{2\pi} e^{\cos \theta} \cos(\sin \theta) d\theta = 2\pi \quad \text{and} \quad \int_0^{2\pi} e^{\cos \theta} \sin(\sin \theta) d\theta = 0$$

~~(b)~~ Evaluate $\oint_C \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)^2(z-2)} dz$, where $C: |z|=3$ by residue theorem.

~~(c)~~ Obtain the Taylor's or Laurent's series expansion for

$f(z) = \frac{(z+2)(z-2)}{(z+1)(z+4)}$, which are valid for (i) $|z| < 1$ and (ii) $1 < |z| < 4$.

4. (a) Evaluate $\int_0^\infty \frac{x^2}{(x^2+a^2)} dx$, $a > 0$ by calculus of complex integration.

(b) Evaluate $\int_0^\infty \frac{\sin ax}{x(x^2+b^2)} dx$, $a > 0$, $b > 0$ by calculus of complex integration.

~~(c)~~ Find the Z-transform of the following sequences.

(i) $f(n) = n^p$, $p > 0$

~~(ii) $f(n) = \cos\left(\frac{n\pi}{2} + \frac{\pi}{4}\right)$~~

5. (a) Find the inverse Z-transform of $F(z) = \frac{2z^2 + 3z}{(z+2)(z-4)}$.

~~(b)~~ Use convolution theorem to find the inverse Z-transform of

$$F(z) = \frac{z^2}{(z-a)(z-b)}$$

(c) Using Z-transform, solve the following difference equations.

$$6y(n+2) - y(n+1) - y(n) = 0, \quad y(0) = 0, \quad y(1) = 1.$$

Total pages: 2

THIRD SEMESTER

End Semester Exam,

MC 205 Probability & Statistics

Time: 3:00 Hours

Max. Marks: 40

Note: Answer any five questions. All questions carry equal marks. You can ask for the statistical tables. Assume suitable missing data, if any.

Roll No: 2K15/MC102

B.Tech. Mathematics & Computing
Nov. 2016

- 1(a) The probability of n independent events are p_i , $i=1,2,\dots,n$. Find an expression for the probability that at least one of the event will happen. Use this result to find the probability of obtaining at least one 6 in a throw of four dice.
- (b) A fair dice has been marked its faces as 1, 3, 5, 7, 9, and 11. If X represents the outcome when we roll this dice then find the variance of X . Also find variance of the sum obtained if k such dice are rolled independently.
- 2(a) Are two independent random variables X and Y uncorrelated? Is the converse true? Justify your answer. Find the value of r when two random variables are related as $2X + 3Y + 4 = 0$.
- (b) State Chebyshev's inequality. Illustrate its application by considering an example of your choice.
- 3(a) If X is a Poisson random variable with parameter 2, then find standard Poisson variable? What is the m. g. f. of this standard variable? What can you say about the sum of three such independent Poisson variates and the mean and variance of the sum?
- (b) If 20% of the memory chips made in a certain plant are defective, what are the probabilities that in a lot of 100 randomly chosen for inspection
- (i) at most 15 will be defective,
 - (ii) exactly 15 will be defective, ✓
 - (iii) no will be defective. ✓
- 4(a) In a year there are 956 births in a town A, of which 52.5% are males, while in towns A and B combined, this proportion in a total of 1406 birth was 0.496. Is there any significant difference in the proportion of male births in the two towns?

03-12-2016 20:13

(b) Describe central limit theorem. Design a suitable numerical example and solve that to illustrate the application of this theorem.

5 (a) A survey of 800 families with four children each recorded the following distribution:

No. of boys:	0	1	2	3	4
No. of girls:	4	3	2	1	0
No. of families:	32	178	290	236	64

Test the hypothesis that male and female births are equally likely.

(b) A random sample of 10 boys had the following I.Q.'s: 70, 120, 110, 101, 88, 83, 95, 98, 107, 100. Do these data support the assumption of a population mean I.Q. of 100? Find a reasonable range in which the most of the mean I.Q. values of sample of 10 boys lie.

6 Explain any two of the followings:

(a) Snedecor's F-Statistic and its applications.

(b) Hypothesis Testing and Types of Errors.

(c) Joint, marginal and conditional distributions.

IIIrd SEMESTER

END SEMESTER EXAMINATION

MC - 207 Differential Equations and Applications

Time: 3 Hours

Max. Marks: 50

Note: Attempt all the questions by selecting any two parts from each question.

- (1) (a) Find the general solution of the homogeneous linear system

$$\mathbf{x}' = \begin{pmatrix} 7 & 4 & 4 \\ -6 & -4 & -7 \\ -2 & -1 & 2 \end{pmatrix} \mathbf{x}.$$

- (b) Solve the initial-value problem

$$\mathbf{x}' = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & -1 \\ 0 & 1 & 1 \end{pmatrix} \mathbf{x}, \quad \mathbf{x}(0) = \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}.$$

- (c) Find all solutions of the equation

$$\mathbf{x}' = \begin{pmatrix} 1 & -1 & 4 \\ 3 & 2 & -1 \\ 2 & 1 & -1 \end{pmatrix} \mathbf{x}.$$

(10)

- (2) (a) Find all the eigen values and eigen functions of the BVP

$$\frac{d^2 y}{dx^2} + \lambda y = 0, \quad y'(0) = 0, \quad y'(2\pi) = 0.$$

- (b) In the Sturm-Liouville problem, show that the set of eigenvalues corresponding to the set of eigenfunctions is orthogonal with respect to the weight function $p(x)$ on the interval $[a, b]$.

- (c) Define the Green function and solve the boundary-value problem

$$y'' + 9y = 3, \quad y'(0) = 0, \quad y(\pi/2) = 0.$$

(10)

- (3) (a) Solve $(z^2 - 2yz - y^2)p + (xy + zx)q = xy - zx.$

(b) Find the complete integral of $9(p^2z + q^2) = 4$.

(c) Find the general solution of the partial differential equation

$$z = pq$$

by using Charpit's equation.

(4) (a) Solve $(D - D' - 1)(D - D' - 2)z = x + e^{2x-y}$.

(b) Solve

$$x^2 \frac{\partial^2 z}{\partial x^2} + 2xy \frac{\partial^2 z}{\partial x \partial y} + y^2 \frac{\partial^2 z}{\partial y^2} - nx \frac{\partial z}{\partial x} - ny \frac{\partial z}{\partial y} + nz = x^2 + y^2.$$

(c) Solve

$$\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} = \cos mx \cos ny.$$

(10)

(10)

(5) (a) Solve the Neumann problem

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$$

for a rectangular plate subject to the boundary conditions:

$$u_x(0, y) = 0 = u_x(a, y), \quad u(x, 0) = x, \quad \text{and} \quad u(x, b) = 0.$$

(b) Find a solution of BVP

$$\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}, \quad 0 < x < L, \quad t > 0$$

$$u(0, t) = 0, \quad u(L, t) = 0, \quad \text{for } t \geq 0,$$

$$u(x, 0) = 0, \quad \frac{\partial u}{\partial t}(x, 0) = x(L - x).$$

(c) Find a solution of BVP

$$\frac{\partial u}{\partial t} = k \frac{\partial^2 u}{\partial x^2}, \quad 0 < x < L, \quad t > 0$$

$$u(0, t) = 0, \quad u(L, t) = 0,$$

$$u(x, 0) = \begin{cases} 1, & 0 < x < L/2 \\ 0, & L/2 < x < L. \end{cases}$$

(10)

Total No. of Pages 1

Roll No. 2K15/mch2

THIRD SEMESTER

B.Tech.

END SEMESTER EXAMINATION

(Nov -2016)

MG-201/MG203/CE/MC/EP/ME/AE/PE/PT

FUNDAMENTALS OF MANAGEMENT

Time: 3 Hour

Max. Marks: 50

Note: Answer any five questions.

All questions carry equal marks.

Q1. "No enterprise can achieve its objectives without systematic planning." Do you agree. Give any 5 reasons in support of your answer. Also comment on why is it that organizations are not able to accomplish all their objectives.

OR

What is organizing? Also discuss the problems in delegation of authority and how to overcome them to make the process more effective.

Q2. Differentiate between Corporate Social responsibility and Managerial ethics. Why has adoption of CSR and ethical practices become important in the conduct of business in the recent times?

Q3. It is said that Marketing and Selling are synonymous. Discuss and give arguments in favor and against the statement. Also discuss in brief 4Ps of Marketing?

OR

"Digital technology has completely metamorphosed the marketing process." Exemplify and explain the above statement.

Q4. What is the objective of Financial Management? Also discuss in brief the different financial decisions that need to be taken by a finance manager.

Q5. What is Knowledge? How relevant is Knowledge Management in today's world?

Q6. Write short notes on any 5.

- Differentiate between efficiency and effectiveness
- Differentiate between leader and manager
- Management is an art or science.
- Maslow's theory of motivation
- Difference between authority, responsibility & accountability
- SWOT analysis
- Functions of Financial Market

03-12-2016 20:14