Total No. of Pages 2 *Roll No. .....*

THIRD SEMESTER **B.Tech. (MC)**

END SEMESTER EXAMINATION ***(Nov.-Dec.-2012)***

MC-201 MATHEMATICS-III

Time: 3:00 Hours ***Max. Marks : 70***

Note : Answer ***ALL*** questions by selecting any ***TWO*** parts from each.
Assume suitable missing data, if any.

1[a] Find the image of the closed half disk $|z| \leq 1$, $img(z) \geq 0$ under the bilinear transformation $W = \frac{z}{(z+1)}$ 7

[b] (i) Find z-transformation for $f_n = \cos(n+1)\theta$.
(ii) Solve the difference equation using z-transformation
$y_{n+2} - 3y_{n+1} + 2y_n = 0,\ y_0 = -1,\ y_1 = 2$ 7

[c] Obtain the first three terms of the Laurent series expansion of the function $f(z) = \frac{1}{(e^z-1)}$ about the point $z = 0$ valid in the region $0 < |z| < 2\pi$ 7

2[a] Find the image of the region bounded by the lines $x - y < 2$ and $x + y > 2$ under the mapping $W = \frac{1}{z}$ 7

[b] Determine the z-transform for the following functions:
(i) $f_n = e^{an}Cos(\beta n)$
(ii) $f_n = n^3$
(iii) $f_n = n^2a^n$ 7

[c] Obtain Laurent series for the function $f(z) = \frac{1}{(z+2)(z^2+1)}$ about point $z_0 = -2$.

3[a] Evaluate the integral $\int_0^\infty \frac{x^2}{(x^2+a^2)^2}dx,\ a > 0.$ 7

[b] Evaluate the integral $\int_{-\infty}^{\infty} \frac{\sin x}{x(x^2-2x+2)}\,dx$ 7

[c] Check whether the function $u(x,y) = x^3 - 3xy^2 - 5y$ is a harmonic function, if yes, then find its harmonic conjugate function V(x,y) 7

4[a] State and Prove Cauchy Integral Theorem. 7

[b] Evaluate $I = \int_c z^n dz, n = 0, \pm 1, \pm 2, \ldots\ldots$ where $C: |z| = r$ transversed in counter clock wise direction. 7

[c] Find the principal value of each complex number
(i) $(-3)^{i/\pi}$
(ii) $(2i)^{1-i}$ 7

5[a] Find all values of $Sin^{-1}\sqrt{5}$ 7

[b] Solve the integral $\int_{-\infty}^{\infty} \frac{\sin x}{x(x^2+1)}\,dx$ 7

[c] Define the followings:
(i) Poles of order 'n' 2
(ii) Essential Singularity 3
(iii) zeros of order n. 2

THIRD SEMESTER **B.Tech. (MC)**

END SEMESTER EXAMINATION *(Nov.-Dec.-2012)*

MC-202 DIFFERENTIAL EQUATIONS

Time: 3:00 Hours *Max. Marks : 70*

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

1[a] Solve $y'' + \frac{1}{x}y' + \left(1 - \frac{n^2}{x^2}\right)y = 0.$ 7

[b] Prove that $[J_{1/2}(x)]^2 + [J_{-1/2}(x)]^2 = \frac{2}{\pi x}.$ 7

2[a] Solve $xy'' + 2y' + \frac{xy}{2} = 0$ in terms of Bessel's function. 7

[b] Show that when n is a positive integer, $J_n(x)$ is the coefficient of z^n in the expansion of $e^{(x/2)\left(z-\frac{1}{z}\right)}$ in ascending and descending powers of Z. Also show that J_n is co-efficient of z^{-n} multiplied by $(-1)^n$ in the expansion of the above expression. 7

3[a] Solve $cos(x+y)p + Sin(x+y)q = Z$ 5

[b] Solve $xp + yq = z - \sqrt{x^2 + y^2 + z^2}.$ 5

[c] Solve $px(z - 2y^2) = (z - qy)(z - y^2 - 2x^2)$ 4

4[a] Show that the equations $xp - yq = x$ and $yx^2p + q = xz$ are compatible and find their solutions. 4

[b] Find a complete, singular and general integrals of $(p^2 + q^2)y = qz.$ 5

[c] $(D^3 - 7DD'^2 - 6D'^3)z = x^2 + xy^2 + y^3 + cos(x - y).$ 5

5[a] Reduce the equation
$r - (2sinx)s - (cos^2x)t - (cosx)q = 0$
to canonical form and hence solve it. 7

[b] Solve $\frac{\partial^2 u}{\partial x^2} = C^2 \frac{\partial^2 u}{\partial t^2}$, $u(0,t) = 0$
$u(a,t) = 0$ 7

6[a] Find the steady state temperature distribution by Fourier transform in a rectangular plate $(0 < x < a,\ 0 < y < b)$, when initially it is kept at zero temperature. Also except the edge $y = b$ which is at temperature T_0, all other edges are kept at zero temperature. **10**

[b] Show that a surface passing through the circle $z = 0,\ x^2 + y^2 = 1$ an satisfying the differential equation S=8xy is $z = (x^2 + y^2)^2 - 1$ **4**

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THIRD SEMESTER **B.Tech. (MC)**

END SEMESTER EXAMINATION ***(Nov.-Dec.-2012)***

MC-203 DISCRETE MATHEMATICS

Time: 3:00 Hours ***Max. Marks : 70***

Note : Answer ***ALL*** questions selecting any ***TWO*** parts from each.
All questions carry equal marks.
Assume suitable missing data, if any.

1[a] Is an injective map from a set to itself a surjective map? Give reasons.

[b] Prove that if R is a partial order relation on A, then R^{-1} is also a partial order on A.

[c] What is Hasse diagram? Let A = {1,2,3,4,12}. Consider the relation of divisibility on A i.e. $a \leq b$ iff a divides b, show that $(A, \leq)$ is a poset and draw its Hasse diagram.

2[a] Show by truth table that a conditional statement is logically equivalent to its contrapositive

Show that $\{[p \Longrightarrow (q \vee r)] \wedge (\sim q)\} \Longrightarrow (p \Longrightarrow r)$ is a tautology.

[b] Obtain pdnf of $(\sim p \vee \sim q) \Longrightarrow (\sim p \wedge r)$ and pcnf of $(\sim p \Rightarrow r) \wedge (q \Leftrightarrow p)$.

[c] (i) Write negation of the following sentence by changing into quantifiers:
"every complete bipartite graph is not planar".
(ii) Express the following statement in terms of existential quantification:
"The number 24 can be written as a sum of two even integers".
(iii) express the following as implication:
"A necessary condition for England to win cricket match is that they have atleast two left-hander batsmen".

3[a] Let G be a group, Let $f : G \to G$ be a function s.t. $f(a) = a^2$, then prove that f is a homorphism iff G is abelian.

[b] Solve the recurrence relation
$a_n - 7a_{n-1} + 10a_{n-2} = 6 + 8n,\ a_0 = 1,\ a_1 = 2$

[c] Prove that the intersection of two subgroups of a group G is again a subgroup of G. Also show by an example that the union of two subgroups need not be a subgroup of G.

4[a] Prove that in a lattice L, a.b is the glb of a and b whereas $(a+b)$ is the lub of a and b.

[b] Show that the poset (P(S),≤) is a Boolean algebra where P(S) is the power set of a set S.

[c] Let $L^n = \{(a_1, a_2, \ldots\ldots a_n): a_i \in \{0,1\} \forall i\}$

Define a partial order on L^n by $a \leq b$ iff $a_i \leq b_i$ $\forall i$ Then show that $(L^n, \leq)$ is a bounded lattice.

5[a] Define degree of a vertex in a graph. Show that the number of vertices of od degree in a graph is even.

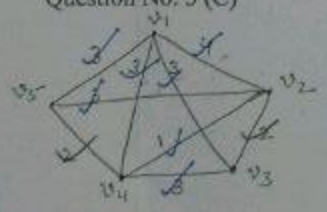
[b] let G be a tree with n vertices. Show that

(i) G has (n-1) edges.

(ii) there is only one path between every pair of vertices.

[c] Write Kurkshal's algorithm. Determine the minimal spanning tree of the graph given below

MC 203 Discrete Maths.
Question No. 5 (C)



THIRD SEMESTER **B.Tech. (MC)**

END SEMESTER EXAMINATION ***(Nov.-Dec.-2012)***

MC-204 DATA STRUCTURE

Time: 3:00 Hours ***Max. Marks : 70***

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

1[a] What are the balancing factors of an AVL tree? Consider the following keys inorder and construct an AVL tree. Show your work step by step. 7
74, 2, 14, 25, 12, 100, 98 and 83.

[b] What are the principal criteria for choosing a Hashfucntion? Write different methods for finding the Hashfunction for a particular problem. 7

2[a] What is B-tree? Draw B-tree of order 3 for the following sequence of keys
2,4,9,8,7,6,3,1,5,10
and also write the application of STACKs and QUEUES with examples. 7

[b] Differentiate between strictly binary tree and threaded binary tree and also explain the responsibilities of a file system with suitable example. 7

3[a] Define a linked list. How are these stored in the memory? Suppose the linked list in the memory consisting of numerical values. Write the procedure for each of the following
(i) To find MAX of the values in the list.
(ii) To find the average MEAN of the values in the list. 7

[b] Create a Binary search tree (BST) for the following sequence
45, 32, 90, 34, 68, 72, 15, 24, 30, 66, 11, 50, 10
Traverse the BST created in preorder and post order. 7

4[a] Describe the Dijkstra's algorithm for finding a shortest path in a given graph with suitable example. 7

[b] Construct a binary tree whose nodes in inorder and preorder are given as

Inorder : 10,15,17,18,20,25,30,35,38,40,50

Preorder:20,15,10,18,17,30,25,40,35,38,50 7

5[a] Consider the following array

20,15,22,30,50,2,8,9,10,60

Show the contents of the array after each sort listed below

(i) Insertion sort (after 3rd iteration)

(ii) Quick sort (After 4th iteration)

(iii) selection sort (after 3rd iteration) 7

[b] What is the difference between prims algorithm and Kruskal's algorithm for finding the minimum spanning tree of a graph? and also explain about mirror image of a tree. 7

6[a] Write a program to subtract two polynomials using linked list and also write an algorithm to insert a node in the beginning of the linked list.

[b] Write an algorithm to search a key in a B-tree. What is the worst case of searching in a B-tree? List the possible situations that can occur while inserting a key in a B-tree? 7

7 Write short notes on any FOUR of the following

[a] Abstract data type and asymptotic notation

[b] Collision resolution techniques

[c] File organization

[d] Adjacency matrix of a graph

[e] DFS and BFS

[f] Doubly linked list and priority queues. 4×3.5

Total No. of Pages 3 *Roll No. .....*

THIRD SEMESTER **B.Tech. (MC)**

END SEMESTER EXAMINATION ***(Nov.-Dec.-2012)***

MC-205 PROBABILITY AND STATISTICS

Time: 3:00 Hours ***Max. Marks : 70***

Note : ***ALL*** the questions are compulsory and are of equal marks. Attempt any ***TWO*** parts out the three set in a question. Assume suitable missing data, if any.

1[a] State addition and multiplication rules of probability. Prove the multiplication rule. A circuit system with five components A, B, C D, and E is shown in the figure given below.

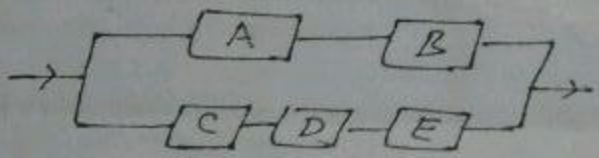


Fig-1

If the probabilities that components A, B, C, D and E will function are 0.7, 0.7, 0.8, 0.8 and 0.8 respectively, find the probability that system will function.

[b] Suppose that 3 batteries are randomly selected from a group of 3 new, 4 used but still working, and 5 defective batteries. If X and Y denote respectively the number of new and used but still working batteries selected, then find the joint probability mass function of X and Y Also find the marginal and conditional distributions for X and Y . Are the two variables X and Y independent?

[c] Define distribution function of a r.v. State its important properties. Suppose that the shelf-life in years of a certain perishable food product packaged in cardboard containers is a r.v. whose p.d.f. is given by

$$f(x) = \begin{cases} e^{-x}, & x > 0 \\ 0, & otherwise \end{cases}$$

Let X_1 X_2 and X_3 represent the shelf-lives of three of these containers selected independently, find $P(X_1 < 2, 1 < X_2 < 3, X_3 > 2)$

2[a] A newspaper boy buys N newspapers at a price of Rs. 'a' each and sells at a price of Rs. 'b' each (b>a). the unsold newspapers are returned at a price of c each (c < a). The probability of selling n newspapers is $p_n(n = 0,1,2,.....)$ Find his expected profit. How may newspapers should the buy to maximize the profit?

[b] State Chebyshev's inequality.

Over the range of cylindrical parts manufactured on a computer-controlled lathe, the S.D. of the diameters is 0.002 milimetres. What about the probability that a new part will be within 0.006 units of the mean for that run? If 400 parts are made during the run, about what proportion do you expect will lie in the interval found.

[c] Define a binomial variate. Find its m.g.f. Show that binomial curve is symmetric when p = ½ and in esokurtic when $n \to \infty$

3[a] Find the probability distribution of a negative binomial variate. Why is it named so?

A drug is known to bring relief in 80% of the cases where it is used Find the probability that the fifth patient to experience relief is the seventh patient to receive the drug during a given week.

[b] State the chief characteristics of the normal probability distribution

In a production of iron rods, the diameter X can be approximated to be normally distributed with $\mu = 2$ and S.D. = 0.008 inches.

What percentage of defectives can we expect if we set the acceptance limits at $2 \neq 0.02$ inches?

How should we set the acceptance limits to allow for 4 % defectives?

[c] Derive the mean and variance in case of Weibull distribution. What are its specific applications?

Suppose that he lifetime (in hrs.) of an electric tube is a random variable X having Weibull distribution with $\alpha = 0.05$ and $\beta = 0.5$. Find

(i) The mean lifetime of these tubes.

(ii) The S.D. of the life time

(iii) The probability that such a tube will last more than 1000 hrs.

4[a] Define the problem of correlation. Are independent random variables uncorrelated? Is the converse true? Explain.

Fit a curve of the form $y = ax^b$ to the following data

x:	2	4	7	10	20	40	60	80
y:	43	25	18	13	8	5	3	2

[b] State central limit theorem. What are its importance.

The number of tourists which can be adjusted comfortably in a coach is 50. The owner, knowing from his past experience that on the average only 80% of those booked seats will actually joint the tour books 60 tourists. Compute the probability that more than 50 tourists will join the tour.

[c] Explain the following:

Null and Alternate Hypothesis

Acceptance and rejection regions

Types of error and level of significance

the mean heights in two samples of 1000 and 2000 men are 67.5 inches and 68.0 inches respectively. Can the two samples be regarded as drawn from the same population of S.D. 2.5 inches?

5[a] Define X^2 variate. Derive its p.d.f. with v degrees of freedom. Show that this distribution is positively skewed and leptokurtic.

[b] The distribution of printing mistakes in the proof of first 392 pages of a book under publishing were found to be as follows:

No. of mistakes in a page (x):	0	1	2	3	4	5	6
No. of pages (f):	275	72	30	7	5	2	1

Fit a Poisson distribution to this data and test the goodness-of-fit.

[c] (i) A new process for producting synthetic diamonds is viable only if the average weight of diamond is greater than 0.5 karat.

The weights of the six diamonds produced are 0.46, 0.61, 0.52, 0.48, 0.57 and 0.54 karat. Test the validity of the process.

(ii) Find the least value of r in a sample of 18 pairs of observations from a bivariate population significant at 5% level.

Total No. of Pages 3 Roll No. .....

THIRD SEMESTER B.Tech. (SE/EEE/EP/CE/EE/ME/MC)

END SEMESTER EXAMINATION (Nov.-Dec.-2012)

SE/EEE/EP/CE/EE/ME/MC –206 ENGINEERING ECONOMICS

Time: 3:00 Hours *Max. Marks : 70*

Note : Answer any *FIVE* questions.
Use of Interest Rate Tables are allowed.
Assume suitable missing data, if any.

1[a] What do you mean by Innovation? Discuss Economics of Innovation. 7

[b] A person is planning a new business. The initial outlay and cash flow pattern for the new business are as listed below. The expected life of the business is five years. Find the rate of return for the new business

period	0	1	2	3	4	5
cash flow (Rs)	- 1,00,000	30,000	30,000	30,000	30,000	30,000

7

2[a] What do you mean by Price Elasticity of Demand? A rise in the price of a product whose demand is elastic will reduce the total revenue of the firm. Explain. 7

[b] Jothi Lakshmi has arranged to buy some home recording equipment. She estimates that it will have five year useful life and no salvage value at the end of equipment life. The dealer, who is a friend has offered Jothi Lakshmi two alternative ways to pay the equipment

(i) Pay Rs.60,000 immediately and Rs15,000 at the end of one year

(ii) Pay nothing until the end of fourth year when a single payment of Rs.90,000 must be made.

If Jothi Lakshmi believes 12% is a suitable interest rate, which alternative is best for her? 7

3[a] Does most technological changes tend to be labour saving or capital saving? Discuss. 7

[b] Three engineering graduate decides to open a business, and all three devote their full time to its management. What opportunity COST would you assign to their time? 3

[c] The demand function for two products X_1 and X_2 are given by:

$X_1 = P_1^{-a_{11}} e^{a_{12}P_2 + a_1}$

$X_2 = P_2^{-a_{22}} e^{a_{21}P_1 + a_2}$

whether the two products X_1 and X_2 are competitive or substitute. 4

4[a] How information technology has revolutionized international trade? Discuss role of engineering manpower as an advantage for India in international trade. 7

[b] A company provides a car to its chief executive. The owner of the company is concerned about the increasing cost of petrol. The cost per litre of petrol for the first year of operation is Rs.71. He feels that the cost of petrol will be increasing by Rs4 every year. His experience with his company car indicates that it averages 19 km/litre of petrol. The executive expects to derive an average of 20,000 km each year for the next four years. What is the annual equivalent cost of fuel over this period of time? If he is offered similar service with the same quality on rental basis at Rs. 60,000 per year, should the owner continue to provide company car for his executive or alternatively provide a rental car to his executive (Assume i = 18%). If the rental car is preferred then the company car will find some other use within the company. 7

5[a] Discuss mechanism of monetary policy and fiscal policy through which inflation is controlled. 7

[b] A man owns a corner plot. He must decide which of the several alternatives to select in trying to obtain a desirable return on his investment. After much study and calculation, he decide that the two best alternatives are as given in the following table:

	Build gas station	build soft icecream stand
First cost(Rs.)	20,00,000	36,00,000
Annual Property taxes (Rs.)	80,000	1,50,000
Annual Income	8,00,000	9,80,000
Life of Building (years)	20	20
Salvage value	0	0

Evaluate the alternatives based on future worth method at i = 12%. 7

6[a] How an engineering institution can fulfill its social responsibility? Discuss. **10**

[b] The chief engineer of a refinery operations is not satisfied with the preliminary design for storage tanks to be used as part of a plant expansion programme. The engineer who submitted the design was called in and asked to reconsider the overall dimension in the light of an article published in Chemical Engineer, entitled "How to size future process vessels"?

The original design submitted called for 4 tanks 5.2 m in diameter and 7 m in height But from the paper it was found that the present ratio of height to diameter 1.35 is 111% of the minimum cost and that the minimum cot for a tank was when the ratio of height to diameter was 4:1 The cost for the tank design as originally submitted was estimated to be Rs.9,00,000. What are the optimum tank dimensions if the volume remains the same as for the original design? What total savings may be expected through the redesign? **4**

7[a] "Cost may be classified in a variety of ways according to their nature and the information needs of management". Explain and discuss the statement giving example of classifications required for different purpose. **7**

[b] A person is planning for his retired life. He has 10 more years of service. He would like to deposit Rs.8,500 at the end of the first year and thereafter, he wishes to deposit the amount with an annual decrease of Rs.500 for the next 9 years with an interest rate of 15%. Find the total amount at the end of 10^{th} year of the above series. 7