Fifth Semester B.Tech Degree Examination

(2013 Scheme)

13.501 : ENGINEERING MATHEMATICS-IV (BCHMPSU)

Model Question Paper

Time: 3 hours Max. Mark: 100

Part A

Answer all question, each question carries **4** marks

1. If f $(x) = \frac{c}{x^2+1}$, $-\infty < x < \infty$ is a pdf , find c and distribution function F(x).

2. The time in hours required to repair a machine is exponentially distributed with mean 20 hours. What is the probability that the required time

   i. Exceeds 30 hours and

   ii. Atmost 10 hours

3. Convert the equation $y = \frac{x}{a+bx}$ to a linear form and write the normal equation to fit it.

4. Explain the terms "null hypothesis", "critical region", 'Type- 2 error" and "level of significance".

5. Obtain all basic feasible solutions to the set of equations

   $2x_1 + 3x_2 + 4x_3 + x_4 = 2$

   $x_1 + x_2 + 7x_3 + x_4 = 4$

Part B

Answer one full question from each module, each question carries 20 marks.

Module-1

6.a) If $f(x) = 5(1-x)^4, 0 \le x \le 1$

= 0 , otherwise .Find P$\left(x \ge \frac{1}{2}\right)$. Also find the mean and variance.

b) A machine manufactured bolts with 3% defectives. In a random sample of 10 bolts, what is the probability that these are

i. Exactly two will be defective
ii. At least two will be defective .

c) Derive mean and variance of Poisson distribution.

7. a) Assume the mean height of soldiers to be 68 inches with a variance of 10.6 inches. How many soldiers in a regiment of 1000 would you expect to be over six feet tall ?

b) A random variable X has a uniform distribution over (-5, 5). Find

i. $P[|x-2|<3]$
ii. Find K for which $P(x<K)=\frac{1}{3}$

c) Find the mean and standard deviation of the following normal distribution

$f(x)=ke^{-2x^2+10x}$

Module-2

8. a) The following data relate to the scores obtained by 9 salesmen of a company in an intelligence test and their weakly sales in thousand rupees

Salesman	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**
Total score	30	60	50	60	80	50	80	40	70
Weekly sales	30	60	40	50	60	30	70	50	60

i. Obtain the regression equation of sales on scores of the salesmen.
ii. If the intelligence test score of a salesman is 55 what would be his expected weekly sales

b) A random sample from 200 villages from a district has average population per village was found to be 420 with a standard deviation of 50. Another random sample of 100 villages from the same district gave an average population 480 per village with a standard deviation of 60. Is the difference between the average of the two samples statistically significant? Use 1% level of significance.

9.a) A sample of 100 items with mean 8.2 Kg , Standard deviation 1.5 Kg. Find 90% confidence limit for the population mean.

b) A compliancy claims that the mean life of its bulbs produced is 1600 hours. A random sample of 100 bulbs gave a mean life of 1570 hours with a standard deviation 120 hours. Test the claims at 5% level of significance.

b) Fit a parabola y= a + bx + cx^2 to the following data

X :	2	4	6	8	10
Y :	3.07	12.85	31.47	57.38	91.29

Module-3

10. a) A firm manufactures 3 products A, B and C. The profits are Rs.3 ,Rs.2 and Rs.4 respectively. The firm has two machines $M_1$and M_2 . Below is required processing time in minutes for each machine on each product

	A	**B**	**C**
M_1	4	3	5
M_2	2	2	4

Machines $M_1$and M_2 have 2000 and 2500 machine - minutes respectively. The firm must manufacture 100 A's, 200 B's and 50 C's but not more than 150 A's. Set up a LPP to maximize profit.

b) Solve by Big-M method

Maximize Z= $6x_1 - 3x_2 + 2x_3$

Subject to $2x_1 + x_2 + x_3 \leq 16$

$3x_1 + 2x_2 + x_3 \leq 18$

$x_2 - 2x_3 \geq 8$

$x_1, x_2, x_3 \geq 0$

11. a)) Solve by Simplex method

Maximize Z= $2x_1 + 3x_2$

Subject to $2x_1 + x_2 \leq 6$

$x_1 + 2x_2 \leq 8$

$x_1 - x_2 \leq 1$

$x_1 \leq 2$

$x_1, x_2 \geq 0$

b)) Solve by Big-M method

Maximize Z= $4x_1 + 5x_2 + 2x_3$

Subject to $2x_1 + x_2 + x_3 \leq 10$

$x_1 + 3x_2 + x_3 \leq 12$

$x_1 + x_2 + x_3 = 8$

$x_1, x_2, x_3 \geq 0$

Module-4

12. a) Solve using the principle of duality

Minimise Z= $2x_1 + 2x_2$

Subject to $2x_1 + 4x_2 \geq 1$

$x_1 + 2x_2 \geq 1$

$2x_1 + x_2 \geq 1$

$x_1, x_2 \geq 0$

b) Solve the following Transportation problem

	D_1	D_2	D_3	D_4	a_i
O_1	19	30	50	10	7
O_2	70	30	40	60	9
O_3	40	8	70	20	18
b_i	5	8	7	14	

13. a) Solve using the principle of duality

Maximise Z= 3

Subject to

b) Solve the following to assign the jobs to machines to minimize the cost

		MACHINES				
		A	**B**	**C**	**D**	**E**
	1	11	17	8	16	20
JOBS	**2**	9	7	12	6	15
	3	13	16	15	12	16
	4	21	24	17	28	26
	5	14	10	12	11	15