



Reg. No. : .....

Name : .....

**Fifth Semester B.Tech. Degree Examination, January 2018  
(2008 Scheme)  
08.501 – ENGINEERING MATHEMATICS – IV (CMPU)**

Time : 3 Hours

Max. Marks : 100

**PART – A**

Answer **all** questions. **Each** question carries **4** marks.

1. Find the mean and variance of the number of heads when 3 coins are tossed.
2. Six dice are thrown 729 times. How many times do you expect atleast 3 dice to show 1 or 2 ?
3. A continuous random variable X has pdf  $f(x) = k(1 - x^2)$ ;  $0 < x < 1$ . Find k and E (X).
4. If X is uniformly distributed random variable with mean 4 and variance  $\frac{4}{3}$ . Find  $P(X < 4)$ .
5. A die was thrown 9000 times and of these, 3220 times got a 3 or 4. Can the die be regarded as unbiased ?
6. Define critical region and level of significance.
7. In a sample of 400 people, 172 were males. Estimate the confidence interval for the population proportion at 95 % confidence interval.
8. Obtain all basic solutions to the set of equations.  
$$2x_1 + 3x_2 + 4x_3 + x_4 = 2,$$
$$x_1 + x_2 + 7x_3 + x_4 = 4$$
9. Define basic solution, basic feasible solution, degenerate and non-degenerate solutions.



10. Write the dual of  $\text{Min } Z = x_1 + 5x_2$ ,  
 subject to  $3x_1 + 2x_2 \geq 2$   
 $-4x_1 + 3x_2 \geq 6$   
 $x_1 - 2x_2 \geq 3$   
 $x_1, x_2 \geq 0$

## PART – B

Answer **one** question from **each** Module. **Each** question carries **20** marks.

## Module – I

11. a) Define the cumulative distribution function and probability density function.

Explain the relation between them. If  $F(x) = \begin{cases} 0, & x < -2 \\ \frac{x^3 + 8}{16} & -2 \leq x < 2, \\ 1, & x \geq 2 \end{cases}$ , find the

pdf and  $P(0 < x < 1)$ .

- b) The amount of time that a machine will run without having to be repaired is a random variable having an exponential distribution with mean 120 days. Find the probability that such a machine will (i) have to be repaired in less than days (ii) not have to be repaired in at least 180 days.
- c) Marks obtained by a number of students in a certain subject are normally distributed with mean 62 and variance 9. If 4 students are selected from this group at random, what is the probability that 3 of them have scored less than 60 marks ?
12. a) Out of 1600 families with 4 children each, how many families would be expected to have (i) 2 boys and 2 girls (ii) at least one boy (iii) no girl (iv) at most 2 girls.
- b) Find the mean, variance and distribution function of the exponential distribution.
- c) In a normal distribution 5% of the items are under 60 and 40 % are between 60 and 65. Find the mean and variance of the distribution.

**Module – II**

13. a) The regression equations between the variables X and Y are  $4X - 5Y + 33 = 0$  and  $20X - 9Y = 107$ . Find the correlation coefficient and the means of the variables.
- b) Compute the coefficient of correlation for the following data :
- |     |   |    |    |    |    |    |
|-----|---|----|----|----|----|----|
| x : | 1 | 3  | 5  | 7  | 8  | 10 |
| y : | 8 | 12 | 15 | 17 | 18 | 20 |
- c) The mean breaking strength of cables supplied by a manufacturer is 1800, with S.D. 100. By a new technique in the manufacturing process, it is claimed that the breaking strength has increased. To test this claim, a sample of 150 cables is tested and is found that the mean breaking strength is 1850. Can we support the claim ?
14. a) Obtain the regression line of Y on X and find the value of Y corresponding to  $X = 18$  from the following data.
- |     |    |    |    |    |    |
|-----|----|----|----|----|----|
| x : | 5  | 10 | 15 | 20 | 25 |
| y : | 16 | 19 | 23 | 26 | 30 |
- b) By the method of least squares, fit a straight line to the following data :
- |     |    |    |    |    |    |
|-----|----|----|----|----|----|
| x : | 1  | 2  | 3  | 4  | 5  |
| y : | 14 | 27 | 40 | 55 | 68 |
- c) A sample of 400 men from South India has a mean height of 65.85 inches and S.D. 2.5 inches, while a sample of 300 men from North India has a mean height of 66.25 inches with S.D. 2.6 inches. Do the data reveal that the North Indians are on the average are taller than the South Indians ?

**Module – III**

15. a) Use simplex method to Maximize  $Z = 2x_1 + 3x_2$ ,  
subject to  $2x_1 + x_2 \leq 6$   
 $x_1 + 2x_2 \leq 8$   
 $x_1 - x_2 \leq 1$   
 $x_1, x_2 \geq 0$
- b) Use Big M method to Minimize  $Z = 4x_1 + 3x_2$ ,  
subject to  $2x_1 + x_2 \geq 10$   
 $-3x_1 + 2x_2 \leq 6$   
 $x_1, x_2 \geq 0$



16. a) Apply the principal of duality to Minimize  $Z = 2x_1 + x_2$ ,  
subject to  $3x_1 + x_2 \geq 3$   
 $4x_1 + 3x_2 \geq 6$   
 $2x_1 + x_2 \geq 3$   
 $x_1, x_2 \geq 0$

b) Solve graphically : Maximise  $Z = 2x_1 + x_2$ ,  
subject to  $x_1 + 2x_2 \leq 10$   
 $x_1 + x_2 \leq 6$   
 $x_1 - x_2 \leq 2$   
 $x_1 - 2x_2 \geq 10$   
 $x_1, x_2 \geq 0$

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