



Reg. No. : .....

Name : .....

**Fifth Semester B.Tech. Degree Examination, December 2015  
(2008 Scheme)**

**08.501 – ENGINEERING MATHEMATICS – IV (CMPU)**

Time : 3 Hours

Max. Marks : 100

Answer **all** questions from Part – **A** and **one full** question from **each** Module of Part – **B**.

**PART – A**

(Each question carries 4 marks)

1. Find the mean and variance of the Binomial distribution.
2. If  $f(x) = Kx^2e^{-x}$ ;  $x > 0$  is the p.d.f of a random variable  $X$ , obtain the value of  $K$ . Also find  $E(X)$  and  $Var(X)$ .
3. On the average 2 bacteria occur in 1cc of water. Use Poisson distribution to find the probability that a sample of 2 cc of water is free from bacteria.
4. If  $X$  is a uniformly distributed continuous random variable with mean 1 and variance  $\frac{4}{3}$ , find  $p(X > 1)$ .
5. Why there are two regression lines ?
6. Prove that  $-1 \leq r \leq 1$ .
7. Explain
  - a) Interval Estimation
  - b) Significance Level
8. Write the dual of  
Maximise  $z = 4x_1 + 5x_2$   
Subject to  $x_1 + x_2 \leq 5$   
 $2x_1 - x_2 \leq 6$   
 $x_1, x_2 \geq 0$





9. Prove that the dual of a dual problem is the primal problem.
10. Find all basic solutions of  $2x_1 + x_2 + 4x_3 = 11$  and  $3x_1 + x_2 + 5x_3 = 14$ .

### PART - B

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

### Module - I

11. a) State any three properties of the cumulative distribution function.
- b) Find the mean and S.D of the random variable whose pdf is
- $$f(x) = Ke^{-(x^2 - 6x + 4)/24}; -\infty < x < \infty$$
- c) If  $P(X \leq 45) = 0.31$  and  $P(X > 64) = 0.08$  for a normal distribution, find the mean and S.D.

12. a) Given  $F(x) = 0$  if  $x < 1$

$$= \frac{1}{3} \text{ if } 1 \leq x < 5$$

$$= \frac{5}{6} \text{ if } 5 \leq x < 9$$

$$= 1 \text{ if } x \geq 9$$

Find  $E(X)$  and  $\text{Var}(X)$ .

- b) If  $X$  follows Poisson distribution with  $P(X = 2) = P(X = 3)$ , find  $P(X = 0)$ .
- c) If  $X$  follows exponential distribution with mean 4, find  $P(X \geq 4)$ .

### Module - II

13. a) State the principle of Least Squares.
- b) Fit a straight line to the following data.

X	:	100	110	120	130	140	150	160
Y	:	82	94	131	200	210	230	260



c) Find the equations of the two regression lines :

X : 1 2 3 4 5 6

Y : 9 8 16 20 15 4

Also estimate Y when X = 4.5.

14. a) What is standard error ? What is the importance of standard error in large sample tests ?
- b) In a sample of 200 people from a town it was seen that 4 are suffering from H1N1. Construct a 95% confidence interval for the proportion of H1N1 patients in the town.
- c) Two samples taken from normal populations gave the following results.

Sample size	Mean	S.D
12	1050	68
10	980	74

Do the samples come from the same population (given that  $\sigma_1^2 = \sigma_2^2$ ).

**Module – III**

15. a) By graphical method find the maximum value of  $z = 50x_1 + 60x_2$  subject to  $2x_1 + 3x_2 \leq 1500$ ,  $3x_1 + 2x_2 \leq 1500$ ,  $0 \leq x_1 \leq 400$  and  $0 \leq x_2 \leq 400$ .
- b) Maximise  $Z = 2x_1 + 2x_2 + 4x_3$
- Subject to  $2x_1 + 3x_2 + x_3 \leq 300$
- $x_1 + x_2 + 3x_3 \leq 300$
- $x_1 + 3x_2 + x_3 \leq 240$

Where  $x_1, x_2, x_3 \geq 0$ .





16. a) Solve by Big – M method.

$$\text{Maximise } Z = x_1 + 2x_2 + 3x_3 - x_4$$

$$\text{Subject to } x_1 + 2x_2 + 3x_3 = 15$$

$$2x_1 + x_2 + 5x_3 = 20$$

$$x_1 + 2x_2 + x_3 + x_4 = 10$$

$$\text{Where } x_1, x_2, x_3, x_4 \geq 0.$$

b) Find the dual of the LPP.

$$\text{Minimise } Z = 10x_1 + 2x_2 - 12x_3$$

$$\text{Subject to } x_1 - 2x_2 - 4x_3 \geq 2$$

$$-x_1 - 3x_2 + x_3 \leq 1$$

$$\text{Where } x_1, x_2, x_3 \geq 0. \text{ Hence solve the problem.}$$