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A – 6365

Reg. No. :

Name :

**Fifth Semester B.Tech. Degree Examination, September 2016
(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. If X is uniformly distributed random variable with mean 1 and variance $\frac{4}{3}$, find $P(X < 0)$.

2. Find the value of 'C' and the distribution function $F(x)$ given the probability density function of a random variable X is given by

$$f(x) = \begin{cases} \frac{C}{x^3}, & \text{if } 1 < x < \infty \\ 0 & \text{otherwise} \end{cases}$$

3. If X is a Poisson variate such that $P(X=1) = \frac{3}{10}$ and $P(X=2) = \frac{1}{5}$, find $P(X=0)$ and $P(X=3)$.

4. By the method of least squares find the best fitting straight line to the data given below :

x : 5 10 15 20 25

y : 15 19 23 26 30.

5. Prove that the value of correlation coefficient lies between -1 and $+1$.

6. Explain the terms parameter and statistic with suitable example.

7. What is point estimation and interval estimation ? Distinguish between an estimator and an estimate.

P.T.O.



8. Solve graphically the L.P.P. Maximize $z = 2x + 3y$ subject to $x + y \geq 1$, $5x - y \geq 0$, $x + y \leq 6$, $x - 5y \leq 0$, $y - x \geq -1$, $y \leq 3$, $x, y \geq 0$.
9. Obtain all the basic feasible solutions of $x_1 + 2x_2 + x_3 = 4$ and $2x_1 + x_2 + 5x_3 = 5$.
10. Show that the dual of dual is primal by using an example.

PART – B

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

Module – I

11. a) The probability distribution function of a random variable X is $f(x) = K e^{-|x|}$. Find K and the cumulative distribution function of X .
- b) In a certain town, 20% samples of the population is literate and assume that 200 investigators take samples of ten individuals to see whether they are literate. How many investigators would you expect to report that 3 people or less and literates in the samples ?
- c) An electrical firm manufactures light bulbs that have a life, before burn-out, that is normally distributed with mean equal to 800 hrs. and a standard deviation of 40 hrs. Find
 - 1) The probability that a bulb burns more than 8.34 hrs.
 - 2) The probability that a bulb burns between 778 and 834 hrs.
12. a) If X is exponentially distributed with a parameter λ , find the value of K such that $\frac{P(X > K)}{P(X \leq K)} = a$.
- b) A bombing plane carrying three bombs flies directly above a railroad track. If a bomb falls within 40 metres of track, the track will be sufficiently damaged to disrupt the traffic. With a certain bomb site the points of impact of a bomb have the probability density function.

$$f(x) = \begin{cases} \frac{100 + x}{10000}, & \text{when } -100 \leq x < 0 \\ \frac{100 - x}{10000}, & \text{when } 0 \leq x < 100 \\ 0, & \text{elsewhere} \end{cases}$$



where x represents the vertical deviation (in metres) from the aiming point, which is the track in this case. Find the distribution function. If all the three bombs are used, what is the probability that the track will be damaged ?

Module – II

13. a) Convert the equation $y = \frac{x}{a + bx}$ to a linear form and hence find the normal equations.

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

Salesmen :	A	B	C	D	E	F	G	H	I
Test scores :	50	60	50	60	80	50	80	40	70
Weekly sales :	30	60	40	50	60	30	70	50	60

1) Obtain the regression equation of sales on intelligence test scores of the salesmen.

2) If the intelligence test score of a salesman is 65, what would be his expected weekly sales ?

c) Calculate Karl-Pearson's coefficient of correlation from the advertisement cost and sales for the following data :

Advertisement Cost :	39	65	62	90	82	75	25	98	36	78
Sales (in Rs.) :	47	53	58	86	62	68	60	91	51	84.

14. a) In a sample of 20 persons from a town it was seen that 4 are suffering from T.B. Find a 95% confidence limits for the proportion of T.B. patients in the town.

b) A company 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 SD 120 hours. Test the claim :

1) at 5% level

2) at 1% level.

c) In a random sample of 1000 persons from town A, 400 are found to be consumers of wheat. In a sample of 800 from town B, 400 are found to be consumers of wheat. Do these data reveal a significant difference between town A and town B, so far as the proportion of wheat consumers is concerned ?



Module - III

15. a) A farmer has 50 acre farm. He can sell all tomatoes, potatoes or radishes he can raise. The price he can obtain is Rs. 2 per kg. for tomatoes, Re. 1 per kg for potatoes and Rs. 2 per kg for radishes. The average yield per acre is 2000 kg of tomatoes, 2500 kg of potatoes and 1500 kg of radishes. Fertilizer is available at Rs. 5 per kg and their amount required per acre is 200 kgs each for tomatoes and for potatoes and 150 kgs for radishes labour required for sowing, cultivating and harvesting per acre is 15 man-days for tomatoes and radishes and 10 man-days for potatoes. A total of 1000 man-days of labour are available at Rs. 40 per man day. Formulate a mathematical model to the problem.

b) Solve the L.P.P. by using simplex method:

$$\max z = 3x_1 + 5x_2 + 4x_3$$

$$\text{subject to } 2x_1 + 3x_2 \leq 8,$$

$$2x_2 + 5x_3 \leq 10,$$

$$3x_1 + 2x_2 + 4x_3 \leq 15$$

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

16. a) Solve the L.P.P. by using Big-M-Method :

$$\text{Minimize } Z = 4x_1 + 2x_2$$

$$\text{Subject to } 3x_1 + x_2 \geq 27,$$

$$-x_1 - x_2 \leq -21,$$

$$x_1 + 2x_2 \geq 30 \text{ and}$$

$$x_1, x_2 \geq 0.$$

b) Find the solution of the L.P.P. by considering its dual

$$\text{Max } Z = 4x_1 + 2x_2 + 3x_3$$

$$\text{Subject to } 2x_1 + 4x_3 \geq 5,$$

$$2x_1 + 3x_2 + x_3 \geq 4,$$

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

