Type: DES

Q1. Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = -1, |x| < 1, |y| < 1$ subjected to $u(\pm 1, y) = 0,\ u(x, \pm 1) = 0$ by taking $h = \frac{1}{2}$. (4)

Q2. Solve $\frac{\partial^2 u}{\partial t^2} = \frac{\partial^2 u}{\partial x^2}, 0 < x < 1, t > 0$ subjected to $u(x, 0) = 100(x - x^2), \frac{\partial u}{\partial t}(x, 0) = 0, u(0, t) = u(1, t) = 0$ taking $h = 0.25$. (3)

Q3. Solve $y'' + (1 + x)y' - y = 0,\ y(0) = y'(0),\ y(1) + y'(1) = 1$ by taking $h = 0.5$. (3)

Q4. If (X, Y) is uniformly distributed over region $R = \{(x, y)/0 < x < y < 1\}$ then find correlation coefficient between X and Y. (4)

Q5. The daily consumption of electric power (in million of KW-hours) is a random variable having the PDF $f(x) = \begin{cases} \frac{1}{9} x e^{-\frac{x}{3}}, x > 0 \\ 0 \qquad x \leq 0 \end{cases}$

If the total production is 12 million KW-hours, determine the probability that there is power cut (shortage) on any given day. (3)

Q6. A lot consists of four bad and six good tubes. Tubes are selected one after the other at random (Without replacement) and are tested till all the bad tubes are detected. What is the probability that the last bad tube is dected at the 10th test?. (3)

Q7. In a bolt factory machine A, B, C manufacture 25%, 35%, 40% of the total output, out of these outputs 5%, 4%, 2% are defecting bolts, a bolt selected is found to be defective, what is the probability that it come from macin C. (4)

Q8. Find the mean and variance of Poisson's distribution. (3)

Q9. Suppose the continuous random variable has joint PDF given by

$f(x, y) = \begin{cases} k(x^2 + \frac{xy}{3}), 0 \leq x \leq 1; 0 \leq y \leq 2 \\ 0, \qquad otherwise \end{cases}$ find i) k ii) $P(X + Y \geq 1)$

. (3)

Q10. If X and Y are two discrete random variable, having joint PDF

$f(x, y) = k(2x + y), x = 0, 1, 2; y = 0, 1, 2, 3$ then find i) k ii) E(X) and E(Y) . (4)

Q11. In the normal distribution 31% of the items are under 45 and 8% items are over 64 , find mean and variance. (3)

Q12. Using graphical method find the maximum value of $Z = 5x_1 + 3x_2$ subjected to the constraints

$$4x_1 + 5x_2 \leq 1000$$
$$5x_1 + 2x_2 \leq 1000$$
$$3x_1 + 8x_2 \leq 1200, \quad x_1 \geq 0, x_2 \geq 0$$

. (3)

Q13. Solve the following transportation problem:

		Destination			
		A	B	C	D
Source	I	11	13	17	14
	II	16	18	14	10
	III	21	24	13	10
Requirement		200	225	275	250

Availability
250
300
400

. (4)

Q14. A manufacturer produces two types of models M_1 and M_2. Each M_1 model requires 4 hours of grinding and 2 hours of polishing, whereas each M_2model requires 2 hours of grinding and 5 hours of polishing. The manufacture has 2 grinders and 3 polishers. Each grinder works for 40 hours a week and each polisher works for 60 hours a week. Profit on an M_1model is Rs. 3 and on an M_2 model is Rs. 4. Whatever is produced in a week is sold in the market. How should the manufacturer allocate his production capacity to the two types of models so that he may make the maximum profit in a week?. (3)

Q15. Using simplex method Maximize $Z = 4x_1 + 3x_2 + 6x_3$ subjected to the constraints

$$2x_1 + 3x_2 + 2x_3 \leq 440$$
$$4x_1 + 3x_3 \leq 470$$
$$2x_1 + 5x_2 \leq 430, \quad x_1 \geq 0, x_2 \geq 0, x_3 \geq 0$$

. (3)