2016

MATHEMATICS

PAPER : MTC 203

LINEAR PROGRAMMING AND STATISTICS

(Old Course)

Full Mark : 80

Time : 3 Hrs

Figures in the right hand margin indicate full marks for the question

(Use only one Answer script for both the group)

GROUP-A (Linear Programming)

Attempt all the questions

1. Answer *any five* from the following 2X5=10
   (a) What is Linear Programming? Give the Mathematical formulation of Linear Programming Problem (LPP).
   (b) What is Optimum solution of LPP? Do every feasible solutions of a LPP are always an optimal solution?
   (c) What is Saddle Point.Give the rules for detecting a Saddle point.

(d) What is a Transportation type problem.
(e) What is mean by Zero-Sum game.
(f) Define Pay-off matrix.
(g) What is a Primial Problem.

2. Choose *any three* from the following 3X3=9

(a) Write a note on Pure strategy and Mixed strategy.

(b) Write the dual of the Problem

$$\text{Min } Z = 3x_1 + x_2$$
$$\text{s.t } 2x_1 + 3x_2 \geq 2$$
$$x_1 + x_2 \geq 1$$
$$\text{with } x_1, x_2 \geq 0.$$

(c) Give any three advantage of linear programming problem.

(d) Write the cutting plane algorithm.

(e) Prove that the dual of a dual is Primial Problem itself.

3. Answer *any three* from the following 7X3=21

(a) Solve the following system of simultaneous equations by using the

Simplex method

$$x_1 + x_2 = 1$$
$$2x_1 + x_2 = 3$$

(b) Show that for any basic feasible solution $\mathbf{x_B}$ of a LPP at any iteration of Simplex algorithm, $\mathbf{z_j - c_j \geq 0}$ for all the non-basic vectors of **A** , then $\mathbf{x_B}$ is a Optimal solution.

(c) Solve the IPP

$$\text{Min } Z = 3x_1 + 5x_2 + 4x_3$$
$$\text{s.t } 2x_1 + 3x_2 \leq 8$$
$$3x_1 + 5x_2 + 4x_3 \leq 15$$
$$2x_2 + 5x_3 \leq 10$$
$$x_1, x_2, x_3 \geq 0.$$

(d) Find the dual of the following system

$$\text{Min } Z_p = x_1 + x_2 + x_3,$$
$$\text{s.t } x_1 - 3x_2 + 4x_3 = 5$$
$$2x_1 - 2x_2 \leq 3$$
$$2x_2 - x_3 \geq 5$$
$$x_1, x_2 \geq 0 \text{ , } x_3 \text{ is unrestricted in sign.}$$

GROUP-B (Statistics)

Attempt all the questions

1. Answer *any five* from the following 2X5=10

(a) Give the properties of Classical Probability.

(b) A bag contains 4 red, 3 green and 5 black balls. If two balls

are drawn at random find the probability that one ball is black and the other is red ball.

(b) What is discrete universiate distribution .

(c) Define Expectation of two dimensional Random Variable.

(d) Define uniform distribution.

(e) Define moment generating function.

(f) What the are criteria of good estimator.

2. Choose *any three* from the following 3X3=9

(a) State and prove Baye's theorem.

(b) If X is a Bernoulli Random variable then E(X) = p and Var(X) = p(1-p).

(c) Find the mathematical expectation and variance of the number of success in "x" independent trials with the probability of success in the i^{th} trial

where i= 1,2,3,.....,n.

(d) Give any three properties of χ^2 - Distribution.

(e) Show that in random sampling from a normal population, the sample mean is a consistent mean.

3. Answer *any three* from the following 7X3=21

(a) There are three machines A,B,C which produce respectively 60%, 30% and 10% of the total no.of items of a factory. The percentage of respective defective outputs of these three machines are respectively 2%, 3% and 4%. An item is selected at random and its found to be defective. Find the probability that the item was produced by machin

(b) If X has a binomial distribution with parameter p and X then
E(X) = np
And Var (X) = nq.

(c) A continuous distribution is given by the density function

$$f(x) = \frac{1}{x\sqrt{2\pi}} e^{-(\frac{1}{2})(\log x)^2}, \quad for\ x > 0$$

$$= 0, \quad for\ x < 0.$$

Find the mean, mode and standard deviation of the distribution.

(d) In 90 throws of a die, face 1 turned 9 times, for face 2 or 3 turned 27 times, face 4 or 5 turns 36 times and 6 turned 18 times. Test at 10% level if the die is honest, it being given that χ^2 for 3 df = 6.25 at 10% level of significance.

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