[This question paper contains 4 printed pages.]

408 *Your Roll No. .....*

B.A. Prog./I **E**

OPERATIONAL RESEARCH

Paper I - Foundations of Operational Research

(Admissions of 2004 and onwards)

Time : 3 Hours *Maximum Marks : 75*

(Write your Roll No. on the top immediately on receipt of this question paper.)

All Section are compulsory and have equal marks.

Attempt any two parts from each Section.

SECTION-I

1. (a) Explain the concept, scope and tools of Operational Research as applicable to business and industry.

   (b) Describe different phases of Operation Research study.

   (c) A plastic manufacture makes the product P_1 and P_2 and has a total production capacity of 18 tons per day. Both P_1 and P_2 require the same production capacity. The firm has a permanent contract to supply at least 4 tons of P_1 and

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at least 6 tons of P_2 per day to another company. Each tons of P_1 requires 40 machine hours of production time and each tons of P_2 requires 100 machine hours of production time. The daily maximum number of machine hours available is 720. Assume than all the firms output can be sold. The profit made is Rs. 160 per tons of P_1 and Rs. 240 per tons of P_2. Formulate this problem as linear programming model, to determine maximum profit.

SECTION II

2. (a) Solve the following set of equations:

$$x + 2y + z = 3$$

$$2x + 5y - z = -4$$

$$3x - 2y - z = 5$$

(b) Show that the vectors (1,2,0), (0,3,1) and (-1,0,1) in R^3 are linearly independet.

(c) Find the eigen values and eigen vector of

$$\begin{pmatrix} 5 & -6 & -6 \\ -1 & 4 & 2 \\ 3 & -6 & -4 \end{pmatrix}$$

SECTION-III

3. (a) Defne a convex set and examine the convexity of the following set:

$S = \{(x, y) : 3x^2 + 2y^2 \leq 6\}$

(b) Define the following terms

(i) Supporting hyperplane

(ii) Halfspaces

(iii) Optimal hyperplane

(c) Define basic feasible solution of a linear programming problem. Determine all possible basic feasible solutions for the following set of equations.

$x_1 + 2x_2 + x_3 = 4$

$2x_1 + x_2 + 5x_3 = 5$

SECTION-IV

4. (a) Person's coefficient of skewness for a distribution is 0.4 & coefficient of variation is 30%. It mode is 88. Find the mean & the median.

(b) Compare the probability of at least one six in 4 tosses of a fair dice. with the probability of at least one double-six in 24 tosses of two fair dice.

(c) State and prove Baye's Theorem.

SECTION-V

5. (a) Two unbiased dice are thrown. Find the expected values of the sum of numbers of points on them.

(b) In a binomial distribution consisting of 5 independent trials, probabilities of 1 and 2 successes are 0.4096 and 0.2048, respectively. Find the parameter 'p' of the distribution.

(c) Define a uniform distribution. Find the mean, variance and mean deviation about mean for a uniform distribution.

SECTION-VI

6. (a) Show that in a Poisson distribution with unit mean, mean deviation about mean is (2/e) times the standard deviation.

(b) Find the correlation coefficient between the sales and expenses from the data give below:

Firm	1	2	3	4	5	6	7	8	9	10
Sales (Rs. Lakhs)	50	50	55	60	65	65	65	60	60	50
Expences: (Rs. Lakhs)	11	13	14	16	16	15	15	14	13	13

(c) The standard deviation of population is 2.70 cms. Find the probability that in a random sample of size 66, the sample mean will exceed the propulation mean by 0.75 cm or more.
(Given that the value of standard normal probability integral from 0 to 2.25 is 0.4877)