Code:: 3459

B. C. A. Semester -V – MARCH-2017

Paper -504 – Operations Research

Time: $2\frac{1}{2}$ Marks:70

Instruction: 1)There are Five compulsory questions in this Q papers.
2) Graph papers will be provided on request.

Instruction:1)There are Five compulsory questions in this Q papers.
2) Graph papers will be provided on request

Q-1 **(a)** Give the general mathematical formulation of L. P. P. **06**

(b) A production manager wants to determine in quantity to be produced per month of the product A and B manufactured by his firm. The data on resource required and availability of resources are given below. **08**

Resources	Requirements A	Requirements B	Available / Month
Row Material(Kg)	60	120	1200
Machine Hours	8	5	600
Assembly Man hours	3	4	500
Sales/ Pieces (Rs.)	30 /-	40/-	

Formulate the product mix so as to Maximize profit?

OR

Q-1 **(a)** Explain various assumptions made in Linear Programming. **06**

(b) Assume that two different foodstuffs F_1 and F_2 are given. They contain vitamins V_1, V_2 and V_3 respectively. The minimum daily requirement of these vitamins are : 1 mg. of V_1, 50 mg. of V_2 and 10 mg. of V_3. Suppose that the foodstuff F_1 contains 1 mg of V_1, 100 mg of V_2 and 10 mg of V_3, whereas foodstuff F_2 contains 1 mg of V_1, 10 mg of V_2 and 100 mg of V_3. The cost of one unit of foodstuff F_1 is Rs. 1.00 and cost of one unit of F_2 is Rs 1.5. Formulate and solve graphically a problem such that minimum daily requirements of each vitamin are supplied by the foodstuff at a minimum cost. **08**

Q-2 **(a)** Define the following terms **4**

i) Objective function, ii) Constraints

iii) Feasible solution iv) Artificial variable

(b) Use the Simplex method to solve the following L.P. Problem. **10**

Maximize $Z = 10x_1 + 15x_2$

Subject to constraints: $2x_1 + x_2 \leq 26$

$2x_1 + 4x_2 \leq 56$

$-x_1 + x_2 \leq 5$ and $x_1 \geq 0, x_2 \geq 0$

OR

Q-2 (a) Define the following terms: 04

(i) Surplus variable ,
(ii) Slack Variable,
(iii) Basic Solution
(iv) Optimal Solution

(b) Use Big -M method to solve following L.P.P. 10

Minimize $Z = 20x + 7y$

Subject to constraints: $6x+4y \geq 30$,

$5x + 2y \geq 23$,

$3x + 5y \geq 9$, $x>0$, $y>0$

Q-3 (a) Explain the Least Cost Method of Transportation Problem.. 04

(b) The following data represents the cost of transporting specific paediatric drug from four different manufacturers A, B, C, and D to 5 chemists C_1, C_2, C_3, C_4 and C_5. The availability of manufactures and requirements of the five chemists are table given on the next page. Find an initial basic feasible solution to the given TP using Vogel's Approximation methods. 10

Origin	Chemists					Supply
	C_1	C_2	C_3	C_4	C_5	
A	3	4	6	8	9	20
B	2	10	1	5	8	30
C	7	11	20	40	8	15
D	2	1	9	14	16	13
Demand	40	6	8	18	6	

Hence find optimal solution of the problem.

OR

Q-3 (a) What is the transportation problem? Give the Mathematical formulation of Transportation Problem. 6

(b) Find the initial basic feasible solution for the following transportation problem using Vogel's approximation method. 8

Factory	Warehouse			
	W_1	W_2	W_3	Supply
F_1	16	20	12	200
F_2	14	8	18	160
F3	26	24	16	90
Demand	160	120	150	

Q-4 (a) Explain Hungerian method for solving assignment problem. 06

(b) In a textile sales emporium, four salesmen A, B, C and D are available to four counters W, X, Y and Z. Each salesman can handle any counter. The service (in hours) of each counter when managed by each salesman is given below: 08

Counters	Salesmen			
	A	B	C	D
W	41	72	39	52
X	22	29	49	65
Y	27	39	60	51
Z	45	50	48	52

How should the salesmen be allocated to appropriate counters so as to minimize the service time? Each salesman must handle only one counter.

OR

Q-4 **(a)** Show that assignment problem is a special case of Transportation problem. **06**

(b) Casualty Medical Officer in a hospital has received four requests for Ambulance van facility. Currently, six vans are available for assignment and the estimated response time(in minutes) are shown in the table below: **08**

Incident	Van					
	1	2	3	4	5	6
1	19	15	13	14	15	18
2	18	16	12	13	17	16
3	14	14	17	16	15	15
4	13	17	19	18	14	17

Determine which van should respond, and what will be the average response time.

Q-5 **(a)** Explain the Johnson's method of solving n- jobs through 3- machines sequencing problem. **08**

(b) Determine the optimum sequence for the jobs, total elapsed time and idle time on each machine for the following jobs on two machines. **06**

Jobs	1	2	3	4	5
Machine I	15	9	17	12	19
Machine II	11	15	16	17	13

OR

Q-5 **(a)** Define the following: **08**

(I) Saddle Point,

(II) Payoff Matrix ,

(III) Value of the game,

(IV) Two person zero-sum game.

(b) Solve the following game whose pay off matrix are given below: **06**

		Player B			
		B_1	B_2	B_3	B_4
Player A	A_1	1	7	3	4
	A_2	5	6	4	5
	A_3	7	2	0	3

Find optimal strategy and the value of the game