

GUJARAT TECHNOLOGICAL UNIVERSITY
MCA– SEMESTER –IV EXAMINATION –SUMMER-2019

Subject Code:2640003**Date: 18-05-2019****Subject Name: Operations Research****Time:10.30 am to 1.00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Q.1 (a) Define Terms (Any SEVEN): **07**

- 1) Slack 2) Inventory 3) Replacement 4) EOQ 5) Activity
 6) Pay-off Matrix 7) Value of Game 8) Maximin Value and Minimax Value

(b) Give any two differences between Transportation and assignment problem. **02****(c) Say TRUE or FALSE:** **05**

- i) Operation Research approach is a Multi-disciplinary.
- ii) A feasible solution of LPP must satisfy all the constraints.
- iii) Number of variables can be atleast two in the Simplex method for solving of LPP.
- iv) The Hungarian method is used to obtain optimum solution of travelling salesman problem.
- v) Crashing concept is applicable in CPM and PERT.

Q.2 (a) What is Operation Research? Discuss various advantages and applications of it. **07****(b) Solve the following LP problem using Big-M method :** **07**

Maximize $Z = 3x_1 + 2x_2$
 subject to the constraints

$$2x_1 + x_2 \leq 2$$

$$3x_1 + 4x_2 \geq 12$$

and $x_1, x_2 \geq 0$.

OR**(b) Solve the following LP problem using Simplex method :** **07**

Maximize $Z = 5x_1 + 3x_2$
 subject to the constraints

$$x_1 + x_2 \leq 2$$

$$5x_1 + 2x_2 \leq 10$$

$$3x_1 + 8x_2 \leq 12$$

and $x_1, x_2 \geq 0$.

Q.3 (a) Discuss Mathematical definition of a Linear Programming Problem (L.P.P.) with its Components. **07****(b) A tape recorder company manufactures models A, B and C, which have profit contributions per unit of Rs 15, Rs 40 and Rs 60, respectively. The weekly minimum production requirements are 25 units for model A, 130 units for model B and 55 units for model C. Each type of recorder requires a certain amount of time for the manufacturing of the component parts, for assembling and for packing. Specifically, a dozen units of model A require 4 hours for manufacturing, 3 hours for assembling and 1 hour for packaging. The corresponding figures for a dozen units of model B are 2.5, 4 and 2 and for a dozen units of model C are 6, 9 and 4. During the forthcoming week, the company** **07**

has available 130 hours of manufacturing, 170 hours of assembling and 52 hours of packaging time. Formulate this problem as an LP model so as to maximize the total profit to the company (Do not solve).

OR

- Q.3 (a)** Determine an initial basic feasible solution to the following transportation problem using (i) Least Cost Method and (ii) Vogel's Approximation Method: **07**

Origins	Destinations				Availability
	D ₁	D ₂	D ₃	D ₄	
O ₁	5	3	6	2	19
O ₂	4	7	9	1	37
O ₃	3	4	7	5	34
Demand	16	18	31	25	90

- (b)** Which are the different methods (other than Hungarian method) available for solving an assignment problem? Explain why it is not practical to use these methods. **07**

- Q.4 (a)** What is the importance of simulation? Discuss advantages and disadvantages of Simulation. **07**

- (b)** There are five jobs to be assigned to five machines. Costs of completion of the jobs on the respective machine are given in the table below: **07**

Job	Machine				
	M ₁	M ₂	M ₃	M ₄	M ₅
J ₁	65	40	90	80	90
J ₂	60	35	100	85	85
J ₃	60	38	105	90	95
J ₄	70	45	120	90	100
J ₅	65	40	105	87	90

Find the optimal assignment of jobs to the machines so as to minimize the total cost Of all the jobs.

OR

- Q.4 (a)** Discuss in detail the various types of inventories. **07**

- (b)** An engineering company priced at Rs. 60,000 including cost of installation. The costs for operation and maintenance are estimated to be Rs. 10,000 for each of the first five years, increasing every year by Rs. 3,000 in the sixth and subsequent years. The company expects a return of 10% on all its investment. What is the optimal replacement period? **07**

- Q.5 (a)** What are the uses and application of CPM/PERT? Discuss similarity and differences between CPM and PERT. **07**

- (b)** Railway marshalling yard, goods trains arrive at a rate of 30 trains per day. Assuming that the inter-arrival time follows an exponential distribution and the service time (the time taken to hump a train) distribution is also exponential with an average of 36 minutes. Calculate the following: **07**

- (i) The average number of trains in a queue.
- (ii) The probability that the queue size exceeds 10.
- (iii) Expected waiting time in a queue.

OR

Q.5 (a) What do you understand by Queue discipline? Describe the characteristics of calling population (input source) of a queuing system. **07**

(b) Precedence relationships of the activities, and activity time estimates (in **07** **07** weeks) of a project is as follows:

Task	A	B	C	D	E	F	G	H	I	J
Precedence	-	A	-	C	B,C	C	F	D,E,G	D,E	H,I
Time	10	5	15	11	10	5	5	10	10	15

1. Draw the network of the project.
Find Critical path and critical activities and expected completion
2. time.
3. Obtain the total, free and independent float values for non-critical activities.
