

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VII (NEW) - EXAMINATION – SUMMER 2017****Subject Code: 2171901****Date: 04/05/2017****Subject Name: Operation Research****Time: 02.30 PM to 05.00 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) Mention different phases of operations research and explain their significance for decision making. **07**

(b) Explain the set of assumptions for Linear Programming Problem, in detail. **07**

Q.2 (a) There are two competing departmental stores A and B in a city. Both have equal reputation and the total no. of customers is equally divided between the two stores. Both the stores plan to run annual discount sales in the last week of December. For this they want to attract more no. of customers by using advertisement through newspaper, radio and T.V. by viewing the market trend, the store A constructed the following pay-off matrix where the numbers in the matrix indicates gain or a loss of customers. Find the optimum strategies for stores A and B. also find the value of the game. **07**

	Store B		
Store A	40	50	-70
	10	25	-10
	100	30	60

(b) An Industry produces two products P and Q, which possess the total production capacity of 9 tonnes per day. P and Q require the same production capacity. The firm has a permanent contract to supply at least 2 tonnes of P and at least 3 tonnes of Q per day to another industry. Each tonne of P requires 20 machine hours production time and each tonne of Q requires 50 machine hours production time. The daily maximum possible no. of machine hours production time. The daily maximum possible no. of machine hours is 360. All the firm's output can be sold, and the profit made is Rs. 80 per tonne of P and Rs. 120 per tonne of Q. Graphically, determine the maximum profit and the product mix for this profit. **07**

OR

(b) Using Simplex method of Linear programming technique, solve the following problem. Also comment on the "type of solution". **07**

$$\text{Maximize } Z = 5x_1 + 4x_2$$

$$\text{Subject to } x_1 - 2x_2 \leq 1$$

$$x_1 + 2x_2 \geq 3$$

$$x_1, x_2 \geq 0.$$

- Q.3 (a)** A company has 3 plants P, Q and R as well as 3 warehouses A, B and C. the supplies are transported from the plants to the warehouses which are located at varying distances from the plants. On account of these varying distances, the transportation costs (per unit) from plants to warehouses as given below. Find out the minimum transportation costs. **07**

		WARE HOUSES			
		A	B	C	SUPPLY
PLANTS	P	12	8	18	400
	Q	20	10	16	350
	R	24	14	12	150
DEMAND		500	200	300	

- (b)** A city corporation has decided to carry out road repairs on four main arteries of city. The government as agreed to make a special grant of Rs. 50 lowest cost and quickest time. If condition warrant, then a supplementary token grant will also be considered favorably. The corporation has floated tenders and 5 contractors have sent in their bids. In order to expedite the work, one road will be assigned to only one contractor. **07**

Contractors/Road	Cost of Repairs (Rs. Lakhs)			
	R1	R2	R3	R4
C1	9	14	19	15
C2	7	17	20	19
C3	9	18	21	18
C4	10	12	18	19
C5	10	15	21	16

- Find the best way of assigning the repair work to the contractors and the costs.
- If it is necessary to seek supplementary grants, then what should be the amount sought?
- Which of the 5 contractors will be unsuccessful in n his bid?

OR

- Q.3 (a)** Differentiate between Transportation and Transshipment problem. How one can use the transportation method for solving the transshipment problem? **07**

- (b) A college department chairman has the problem of providing teachers for all courses offered by his department at the highest possible level of educational quality. He has got 3 professors and 1 teaching assistant (TA). Four courses must be offered and after appropriate investigation, he has arrived at the following relative regarding the ability of each instructor to teach each of the four courses, respectively. 07

	Course 1	Course 2	Course 3	Course 4
Prof. 1	70	50	70	80
Prof. 2	30	70	60	80
Prof. 3	30	40	50	70
TA	40	20	40	50

How should he assign his staff to the courses to maximize educational quality in his department?

- Q.4** (a) Explain the various elements of queuing system. 07
 (b) The cost per year of running a vehicle is given below. The purchase price is Rs. 50,000. 07

Year (n)	1	2	3	4	5	6	7
Resale Value	30000	15000	7500	3750	2000	2000	2000
Maintenance cost	5000	6000	7000	9000	11500	16000	18000

Thereafter, the running cost increase by Rs. 2,000, but the resale value remains constant at Rs. 2,000. When the vehicle should be replaced?

OR

- Q.4** (a) A road transport company has one reservation clerk on duty at a time. He handles information of bus schedule and makes reservations. Customers arrive at a rate of 8 per hour and the clerk can service 12 customers on the average per hour. After stating your assumptions, answer the following: 07
- What is the average no. of customers waiting for the service of the clerk?
 - What is the average time a customer has to wait before getting service?
 - The management is planning to install a computer system to handle the information and reservations. This is expected to reduce the service time from 5 to 3 minutes. The additional cost of having the new system works out to Rs. 50 per day. If the cost of goodwill of having a customer to wait is estimated to be 12 paise per minute spent waiting before served, should be the company install the computer system? Assume 8 hours working day.
- (b) Completely describe the various costs involved with "Inventory Control". 07

Q.5 (a) A project consists of 10 activities for which the relevant data are given below: **07**

Activity	Preceding activity	Activity Duration (Hours)
A	-	0.5
B	A	1.0
C	B	1.5
D	B	1.4
E	D	1.2
F	B	0.8
G	F	1.0
H	C,E,G	0.4
I	H	1.4
J	I	0.5

- Draw the network and find the project completion time.
- Calculate Total float for each of the activities.

(b) A manufacturer has to supply his customers 600 units of his product per year. Shortages are not allowed and the inventory carrying cost amount to Rs. 0.60 per unit year. The set up cost per run is Rs. 80. Find : **07**

- The Economic Order Quantity.
- The minimum average yearly cost.
- The optimum no. of orders per year.
- The optimum period of supply per optimum order.
- The increase in the total cost associated with ordering: (a) 20 % more, and (b) 40 % less than EOQ.

OR

Q.5 (a) The research department of a manufacturing company wants to launch 3 types of products. The marketing manager has to decide one of the product to be launched under the following estimated payoffs for various levels of sales: **07**

Type of product	Estimated values of sales (units)		
	15,000	10,000	5,000
A	30	10	10
B	40	15	5
C	55	20	3

What will be the marketing manager's decision if Maximin and Minimax Criteria are applied?

(b) What are the 3 time estimates used with reference of PERT? How are the expected duration of a project, and its standard deviation calculated? **07**
