

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VII (OLD) EXAMINATION – SUMMER 2019

Subject Code: 171901

Date: 21/05/2019

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) What is OR? What are the characteristics and limitation of OR techniques? **07**
 (b) Solve problem by Graphical method: Maximize $Z = 3X_1 + 4X_2$; **07**
 Subjected to: $5X_1 + 4X_2 \leq 200$; $3X_1 + 5X_2 \leq 150$; $5X_1 + 4X_2 \geq 100$; $8X_1 + 4X_2 \geq 80$; $X_1, X_2 \geq 0$

- Q.2** (a) Three grades of coal A, B and C contain phosphorus and ash as impurities. In a particular industrial process, fuel up to 100 ton (maximum) is required which should contain ash not more than 3% and phosphorous not more than 0.03%. It is desired to maximize the profit while satisfying these conditions. There is an unlimited supply of each grade. The percentage of impurities and the profit of grades are given below: **07**

Coal	Phosphorous (%)	Ash (%)	Profit (Rs/ton)
A	0.02	3.0	12
B	0.04	2.0	15
C	0.03	5.0	14

Find the proportions in which the three grades are used.

- (b) Explain the concept of degeneracy in Simplex method. How is it resolved? **07**
OR
 (b) Explain the following with reference to L.P.P. **07**
 1. Slack Variable and Surplus Variable
 2. Entering Variable & Leaving Variable
- Q.3** (a) What is degeneracy? How does the problem of degeneracy arise in a transportation problem? How can we deal with this problem? **07**
 (b) Solve the following assignment problem: **07**

	I	II	III	IV	V
1	11	17	8	16	20
2	9	7	12	6	15
3	13	16	15	12	16
4	21	24	17	28	26
5	14	10	12	11	13

OR

- Q.3** (a) What is an unbalanced assignment problem? How is the Hungarian Assignment Method applied in respect of such a problem? **07**
 (b) Find the basic feasible solution of the following transportation problem by north-west corner rule. **07**

	1	2	3	4	5	Available
A	4	3	1	2	6	80
B	5	2	3	4	5	60
C	3	5	6	3	2	40
D	2	4	4	5	3	20
Required	60	60	30	40	10	

- Q.4 (a)** A Branch of bank has only one typist. Since the typing work varies in length the typing rate is randomly distributed approximating a Poisson distribution with mean service rate of 8 letters type per hour. The letters arrive at a rate of 5 per hour during the entire 8- hours work day. If the typewriter is valued at Rs. 1.50 per hour, determine: **07**

- Equipment utilization
- The percent time that an arriving letter has to wait.
- Average system time
- Average cost due to waiting on the part of typewriter *i.e.* it remaining idle.

- (b)** What is simulation? What are different phases of simulation process? Differentiate between deterministic and stochastic simulation models. **07**

OR

- Q.4 (a)** Derive the EOQ formula $Q = \sqrt{\frac{2C_o D}{C_h}}$ Where C_o = Ordering cost, D = Uniform demand and C_h = Inventory holding cost. **07**

- (b)** Explain the following : **07**
- Minimax and maximin principals
 - Two person zero sum game.

- Q.5 (a)** Explain Crashing of network. Why it is required? **07**

- (b)** The maintenance cost and resale value per year of a machine whose purchase price is Rs. 7000 is given below: **07**

Year	1	2	3	4	5	6	7	8
Maintenance cost (Rs.)	900	1200	1600	2100	2800	3700	4700	5900
Resale value (Rs.)	4000	2000	1200	600	500	400	400	400

OR

- Q.5 (a)** Define following terms with respect to CPM/PERT : **07**

- Event
- Merge event
- Burst event,
- activity
- Processor activity
- Successor activity
- Dummy activity

- (b)** Give the difference between C.P.M and P.E.R.T **07**
