

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**
