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 $\mathbf{Z = 3X_1 + 4X_2}$; **07**
Subjected to: $\mathbf{5X_1 + 4X_2 \leq 200; 3X_1 + 5X_2 \leq 150; 5X_1 + 4X_2 \geq 100; 8X_1 + 4X_2 \geq 80 ; X_1 , X_2 \geq 0}$

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**

a) Equipment utilization
b) The percent time that an arriving letter has to wait.
c) Average system time
d) 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 $\mathbf{C_o}$ = Ordering cost, **D**= Uniform demand and $\mathbf{C_h}$ = Inventory holding cost. **07**

(b) Explain the following : **07**

a) Minimax and maximin principals
b) 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**

a) Event
b) Merge event
c) Burst event,
d) activity
e) Processor activity
f) Successor activity
g) Dummy activity

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

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