GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–VI(OLD) – EXAMINATION – SUMMER 2019

Subject Code:161601   **Date:29/05/2019**
Subject Name: Modelling Simulation And Operations Research
Time:10:30 AM TO 01:00 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) State the definition of Operation Research. Also explain the phases of Operation Research. **07**

(b) What is LPP? A company manufacturer 3 types of pats which use precious metals platinum and gold. Due to shortage of these precious metals, the government regulates the amount that may be used per day. The relevant data with respect to supply, requirements, and profits are summarized in the table as follows: **07**

Product	Platinum required/unit (gms)	Gold required/unit (gms)	Profit/unit (Rs)
A	2	3	500
B	4	2	600
C	6	4	1200

Daily allotment of platinum and gold are 160gm and 120gm respectively. How should the company divided the supply of scarce precious metals?
Formulate it as a linear programing problem.

Q.2 (a) Solve the following LPP by graphical method **07**

Minimize $Z=40x_1 + 24x_2$ Total Cost
Subject to

$20 x_1 + 50 x_2 \geq 4800$ Phosphate Requirement
$80 x_1 + 50 x_2 \geq 7200$ Nitrogen Requirement
$x_1, x_2 \geq 0$

(b) Solve following LPP using Simplex Method: **07**
Minimize $Z=40x_1 + 35x_2$ Profit
Subject to

$2 x_1 + 3 x_2 \leq 60$ Raw Material Constrain
$4 x_1 + 3 x_2 \leq 96$ Labor Hours Constrain
$x_1, x_2 \geq 0$

OR

(b) Solve following LPP by Big-M method. **07**
Minimize $Z=120x_1 + 60x_2$
Subject to

$20 x_1 + 30 x_2 \geq 900$
$40 x_1 + 30 x_2 \geq 1200$
$x_1, x_2 \geq 0$

Q.3 (a) Formulate classical transportation problem mathematically or provide transportation model **07**

(b) Solve below example using North West Corner rule and the Least Cost method of obtaining an initial feasible solution for a transportation problem. **07**

From⇩ \ To⟹	P	Q	R	S	Supply
A	12	10	12	13	500
B	7	11	8	14	300
C	6	16	11	7	200
Demand	180	150	350	320	1000

OR

Q.3 (a) Explain primal and dual relationship. **07**

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(b) Consider the following transportation problem. Obtain an initial feasible solution for a transportation problem by VAM method. **07**

From ⇩ To ⇒	P	Q	R	S	Supply
A	12	10	12	13	500
B	7	11	8	14	300
C	6	16	11	7	200
Demand	180	150	350	320	1000

Q.4 (a) Solve the following assignment problem by (a) enumeration method and (b) Hungarian assignment method **07**

Time (in minutes)

Worker	Job 1	Job 2	Job 3
A	4	2	7
B	8	5	3
C	4	5	6

(b) Explain the difference between PERT and CPM **07**

OR

Q.4 (a) A dispatcher of the police department has received four requests for police assistance. Currently six patrol cars are available for assignment and the estimated response time (in minutes) are show in the table that follows: **07**

Incident	Patrol unit					
	1	2	3	4	5	6
I	6	5	3	4	5	6
II	8	6	2	3	7	6
II	4	4	7	6	5	5
IV	3	7	9	8	4	7

(a) Which patrol units should respond?
(b) What will be the average response time?

(b) Draw a network from the below given information and determine the critical path **07**

Activity	Immediate Predecessor(s)	Activity	Immediate Predecessor(s)
A	-	G	C,F
B	-	H	B
C	-	I	E,H
D	A,B	J	E,H
E	B	K	C,D,F,J
F	B	L	K

Q.5 (a) What is queuing theory? Explain general structure of the queuing system. **07**

(b) What is simulation? Explain advantages, disadvantages and application of simulation. **07**

OR

Q.5 (a) A firm is using a machine whose purchase price is Rs. 13000. The installation charges amount Rs. 3600 and the machine has a scrap value of Rs. 1600 because the firm has a monopoly of this type of work. The maintenance cost in various years is given in the following table. **07**

Year	1	2	3	4	5	6	7	8	9
Cost (Rs.)	250	750	1000	1500	2100	2900	4000	4800	6000

The firm wants to determine after how many years should the machine be replaced on economic consideration assuming that the machine replacement can be done only at the year ends.

(b) Arrivals at the telephone booth are considered to be Poisson with an average time of 10minutes between one arrival and the next. The length of a phone call is assumed to be distributed exponentially with mean 3 minutes. Find **07**
(i) The probability that an arrival finds that four persons are waiting for their turn ;
(ii) The average number of persons waiting and making telephone calls ; and
(iii) The average length of the queue that is formed from time to time.

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