GUJARAT TECHNOLOGICAL UNIVERSITY ME - SEMESTER - IV(NEW) - EXAMINATION – SUMMER - 2017

Subject Code: 2744602 Subject Name: Advance Operation Research Time: 02:30 pm to 05:00 pm Instructions:

- 1. Attempt all questions.
- 2. Make suitable assumptions wherever necessary.
- 3. Figures to the right indicate full marks.
- Q.1 (a) What is operation research? Give features of OR. Describe briefly its 07 applications.
 - (b) A firm produces an alloy having the following specifications:
- 07

- i) Specific gravity ≤ 0.98
- ii) Chromium $\geq 8\%$
- iii)Melting point $\ge 450^{\circ}$ C

Raw materials A, B and C having the properties shown in the table can be used to make an alloy. Cost of various raw materials per ton are: Rs. 90 for A, Rs. 280 for B and Rs. 40 for C. Formulate the LP model to find the proportions in which A, B and C be used to obtain an alloy of desired properties while the cost of raw material is minimum.

Droparty	Properties of raw material				
Flopenty	А	В	С		
Specific gravity	0.92	0.97	1.04		
Chromium (%)	7	13	16		
Melting point (deg C)	440	490	480		

Q.2 (a) Solve the LP problem using graphical method.

Max. Z = 2 X1 + X2Subject to constraints: $X1 + 2X2 \le 10$; $X1 + 2X2 \le 6$; $X1 - X2 \le 2$; $X1 - 2X2 \le 1$; $X1, X2 \ge 0$;

- (b) Solve the following LP problem using simplex method. MIN. Z = 12 X1 + 20 X2Subject to constraints: $6 X1 + 8 X2 \ge 100;$ $7 X1 + 12 X2 \ge 120;$ $X1, X2 \ge 0;$ OR
- (b) Convert the following primal into its dual. Also write standard form of that 07 dual and write the first matrix for initial basic solution.

Max. Z = 5 X1 - 2 X2 + 3 X3Subject to constraints: $2X1 + 2X2 - X3 \ge 2$; $3X1 - 4X2 \le 3$; $X2 + 3X3 \le 5$; $X1, X2, X3 \ge 0$; 07

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Date:03/05/2017

Total Marks: 70

Q.3 (a) Find the initial basic feasible solution to the following problem by: Least 07 cost method and VAM. State which method is better and why?

			То		Supply
		1	2	3	Suppry
	1	5	1	7	10
From	2	6	4	6	80
	3	3	2	5	15
Demand		75	20	50	_

(b) Four machines are to be assigned to four workers. The cost of assignment 07 is as shown below. Find the optimal assignment.

	А	В	С	D
M1	15	13	14	17
M2	11	12	15	13
M3	13	12	10	11
M4	15	17	14	16

OR

- **0.3** (a) Give the mathematical formulation of an assignment problem. Explain how 07 to view it in terms of an LPP problem.
 - (b) Discuss feasible solution, infeasible solution and unbounded solution in 07 context of LPP graphical solution with neat sketches.
- (a) Solve the following game by dominance and find out the game value. 07 **Q.4**

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		Player B					
	Strategy	Ι	II	III	IV	V	VI
	Ι	4	2	0	2	1	1
A	II	4	3	1	3	2	2
yeı	III	4	3	7	-5	1	2
Pla	IV	4	3	4	-1	2	2
	V	4	3	3	-2	2	2

(b) Solve the following 2 x n game by the method of subgames:

		Player B			
		B1	B2	B3	
Player A	A1	1	3	10	
	A2	7	5	2	

OR

(a) Discuss the basic elements of queuing theory. Explain Kendall's notation. 07 0.4

A factory manufacturing tanks for military use has a separate tool room 07 **(b)** where special maintenance tools are stored. The average time between requirements of tool from tool room is 12 minutes and this follows the poison's distribution. Average service time of the store keeper is 10 minutes. Determine:

i. Average queue length

- ii. Average length of non-empty queue
- iii. Mean waiting time of a mechanic
- iv. Average waiting time of mechanic who waits
- Define the following terms: 0.5 (a)
 - 1. Maximal Flow Problem
 - 2. Minimum Spanning Tree Algorithm
 - 3. Shortest Path Problem
 - (b) Discuss Integer linear programming. Give an example each of a pure and 07 a mixed integer linear programming problem

Q.5 (a) Determine the critical path and project duration (in minutes) for given 07 activities. Also find out floats for any four non-critical activities.

Activity	Duration	Activity	Duration	Activity	Duration
1-2	10	2-6	3	5-7	7
1-3	6	3-8	12	6-7	15
1-4	7	4-6	9	7-9	4
2-5	3	4-8	8	8-9	6

(b) For the given activities (in days) determine:

I) Critical path using PERT.

II) Calculate variance and standard deviation for critical activities.III) Calculate probability of completing the project in 26 days.

For z = 0.7682, area = 0.7782

Activity	to	tm	tp	Activity	to	tm	tp
1-2	6	9	12	3-5	1	1.5	5
1-3	3	4	11	2-6	5	6	7
2-4	2	5	14	4-6	7	8	15
3-4	4	6	8	5-6	1	2	3

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