GUJARAT TECHNOLOGICAL UNIVERSITY ME 4th - SEMESTER • EXAMINATION – SUMMER - 2016

Subject Code: 2744602 Subject Name: Advance Operation Research Time: 10:30 am to 1:00 pm Instructions:

Date: 04/05/2016

- 1. Attempt all questions.
- 2. Make suitable assumptions wherever necessary.
- 3. Figures to the right indicate full marks.
- Q.1 (a) Define operation research. Discuss the assumptions of Linear 07 programming problem.
 - (b) A person wants to decide the constituents of a diet to fulfil his daily 07 requirements of proteins, fat and carbohydrates at the minimum cost. The choice is to be made from four types of foods. The yields per unit of these foods are given as follows. Formulate the LP model.

U				
Food type		Cost per unit		
	Proteins	Fat	Carbohydrates	(Rs.)
1	3	2	6	45
2	4	2	4	40
3	8	7	7	85
4	6	5	4	65
Minimum requirement	800	200	700	

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

Max. Z = 4 X1 + 6 X2Subject to constraints: X1 + X2 Ö60; $X2 \times 6;$ X2 Ö24; $X1 - X2 \times 0;$ 0 ÕX1 Õ20;

(b) Solve the following LP problem using simplex method. Maximize Z = 2 X1 + 5 X2, Subject to constraints, 2 X1 + X2 ≤ 2, 3 X1 + 2 X2 ≥ 6, X1, X2 ≥ 0.

OR

(b) Solve the LP problem using graphical method. 07 Z = -X1 + 2X2, Subject to constraints, $-X1 + 3X2 \le 12$, $X1 + X2 \le 8$, $X1 - X2 \le 6$, $X1, X2 \ge 0$.

Total Marks: 70

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Q.3 (a) Find the initial basic feasible solution to the following problem by:

- (i) Least cost method
- (ii) North west corner rule

State which method is better and why?

		Supply		
From	2	7	4	5
	3	3	1	8
	5	4	7	7
	1	6	2	14
Demand	7	9	18	

(b) Four machines M1, M2, M3 and M4 are to be installed in a machine shop. 07 There are five places A, B, C, D and E available. Machine M2 cannot be placed at C and M3 cannot be placed at A. The cost of assignment is as shown below. Find the optimal assignment.

	А	В	С	D	Е
M1	4	6	10	5	6
M2	7	4	-	5	4
M3	-	6	9	6	2
M4	9	3	7	2	3

OR

- (a) Explain Kendalløs notations for queuing system. 07
- (b) What is degeneracy in transportation problems? Explain how to resolve 07 degeneracy in it.

ł	Reduce the following game by dominance and find its value.							
			Player B					
I II III IV								
	Ā	Ι	6	4	8	0		
er ,	II	6	8	4	8			
	lay	III	8	4	8	0		
	Ч	IV	0	8	0	16		

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

 $\begin{tabular}{|c|c|c|c|c|} \hline Player B \\ \hline B1 & B2 & B3 \\ \hline Player A & A1 & 2 & 4 & 12 \\ \hline A2 & 9 & 6 & 3 \\ \hline \end{tabular}$

OR

- (a) Discuss the basic elements of waiting line theory. Explain the terms:
 - 1. Balking

Q.4 (a)

- 2. Reneging
- 3. Jockeying.
- (b) A Punjab national bank has only one typist. Since the typing work varies 07 in length, the typing rate is randomly distributed approximately. A poisons distribution with mean service rate of 8 letters per hour. The letters arrives at the rate of 5 per hour during the entire 8 hour work day. If the typewriter is values at Rs. 1.5 per hour, determine:
 - 1. Equipment utilization
 - 2. The % idle time that an arriving letter has to wait
 - 3. Average system time
 - 4. Average cost due to waiting on the part of typewriter

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Q.5 (a) The time estimates and precedence relationships of different activities 07 constituting a small construction project is given in following table.

Activity	Α	В	С	D	Е	F	G	Н	Ι
Predecessor	-	-	В	В	Α	Α	F	C, E, G	F
Duration(Days)	3	8	6	5	13	4	2	6	2

(i) Construct the network

(ii) Determine project completion time.

(iii) Find the critical path

(b) The time estimates (in weeks) for the activities of a PERT network are 07 given below.

0			
Activity	to	Tm	tp
1-2	1	1	7
1-3	1	4	7
1-4	2	2	8
2-5	1	1	1
3-5	2	5	14
4-6	2	5	8
5-6	3	6	15

(i) Construct the network diagram

(ii) Find the critical path and project duration

(iii) What is the probability that the project will be completed no more than 4 weeks later than expected time? (for Z=1.33, p=0.9082)

OR

(a) Distinguish between CPM and PERT.

07 (b) Explain the concept of Shortest path problem and Maximal flow problem. 07
