Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
MCA - SEMESTER–IV EXAMINATION – WINTER 2018

Subject Code: 2640003   **Date: 22/11/2018**
Subject Name: Operations Research
Time: 10.30 am to 1.00 pm   **Total Marks: 70**
Instructions:
      1. Attempt all questions.
      2. Make suitable assumptions wherever necessary.
      3. Figures to the right indicate full marks.

Q 1a Do as directed :   **07**
      (1) What is operation research ?
      (2) TRUE/FALSE : Hungarian method is a method for solving assignment problem.
      (3) Write full form of : NWCM
      (4) What is fair game ?
      (5) What is meaning of lead time in inventory control policy?
      (6) List out component of linear problem.
      (7) What is simulation ?

Q 1b Write difference between PERT & CPM   **07**

Q 2a Find Initial basic feasible solutions (i) NWCM. (ii) LCM   **07**

Source	Destination				Supply
	D	E	F	G	
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Demand	200	225	275	250	

Q 2b National Oil Company (NOC) has three refineries and four depots. Transportation Cost per **07**
ton, capacities and requirements are given below:

	D1	D2	D3	D4	Capacity
R1	19	30	50	10	7
R2	70	30	40	60	9
R3	40	8	70	20	18
Require ment	5	8	7	14	

Determine initial basic feasible solution using Voggel's Approximation method(VAM).

OR

Q 2b A lead draftsman has five drafting tasks to accomplish and five idle draftsmen. Each draftsman is estimated to require the following number of hours for each task. **07**

Draftsmen	Tasks				
	A	B	C	D	E
1	60	50	100	85	95
2	65	45	100	75	90
3	70	60	110	97	85
4	70	55	105	90	93
5	60	40	120	85	97

If each draftsman costs the company Rs. 15.80 per hour including overhead, find the assignment of draftsmen to tasks that will result in the minimum total cost. What is the total cost?

Q 3a (i) Write assumption of sequencing problem. **07**
(ii) Write advantages of simulation.

Q 3b A book binder has one printing press, one binding machine, and manuscripts of a number of books. The time required performing the printing and binding operations on each book are shown below. The binder wishes to determine the order in which the books should be processed, so that the total time required to process all books is minimized , find idle time for each machine. **07**

Book	1	2	3	4	5	6	7
Printing Time (Hours)	20	90	80	20	120	15	65
Binding Time (Hours)	25	60	75	30	90	35	50

OR

Q 3a Find a sequence that minimizes the total elapsed time required to complete the following tasks. Find total elapsed time and idle time for different machine. **07**

	1	2	3	4	5	6
Time on Machine 1	3	12	5	2	9	11
Time on Machine 2	8	6	4	6	3	1
Time on Machine 3	13	14	9	12	8	13

Q 3b Suppose an organization is manufacturing two products P1 and P2. The profit per tone of the two products is Rs. 50 and Rs. 60 respectively. Both the products require processing in three types of machine. The following Table indicates the available machine hours per week and the time required on each machine for one tone of P1 and P2. Formulate this product mix problem in the linear programming form. **07**

Profit /tonne	Product 1	Product 2	Total available Machine hours/weeks
Machine 1	2	1	300
Machine 2	3	4	509
Machine 3	4	7	812

Q 4a Adjoining is a list and description of activities for a project XYZ building a boat. Draw the network: **07**

Activity	Description	Predecessor
A	Design hull	None
B	Prepare boot shed	None
C	Design Mmst and mast mount	None
D	Obtain hull	A
E	Design sails	A,B
F	Obtain mast mount	A,B,C
G	Obtain mast	D,E,F
H	Design rigging	F
I	Prepare hull	E,F
J	finish	I

Q 4b (i) Find the saddle point of this game? **07**

Player B

Player A	b1	b2	b3
a1	- 1	2	- 2
a2	6	4	- 6

(ii) What is simulation? Give any two example of simulation & Explain meaning of simulation by differentiate "simulation is…" & "simulation is not".

OR

Q 4a A project consists of eight activities with the following relevant information: **07**

Activity	Estimated duration(days)		
	Optimistic	Most	Pessimistic
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

Draw the PERT network and find out the expected project completion time.

Q 4b What is inventory management? List out the factors on which quantity of orders depends. & **07**
list the various types of costs which involved in inventory system.

Q 5a Solve following LPP by graphical method: **07**

Maximize $Z = 4X_1 + 3X_2$
  subject to
$$200X_1 + 100X_2 \leq 4000$$
$$50 \leq X_1 + 2X_2$$
$$40X_1 + 40X_2 \leq 1400$$
where $X_1, X_2 \geq 0$

Q 5b Find Dual of following linear programming problem: **07**

Max $Z = 7X_1 + 3X_2 + 8X_3$
  subject to constraints

$$8X_1 + 2X_2 + X_3 \leq 3$$
$$3X_1 + 6X_2 + 4X_3 \leq 4$$
$$4X_1 + X_2 + 5X_3 \leq 1$$
$$X_1 + 5X_2 + 2X_3 \leq 7$$

where $X_1, X_2, X_3 \geq 0$

OR

Q 5a How many network representation in project management ? Explain the behaviours of arrivals **07**
in queuing system.

Q 5b A Product's purchase price is 13000 Rs. And installation charge is Rs. 3600. Its scrap value is **07**
Rs. 1600. The operating cost of different year are given in following table.

Year	1	2	3	4	5	6
Operating cost	250	750	1000	1500	2100	2900

Determine optimal replacement policy.

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