Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
MCA – SEMESTER – IV • EXAMINATION – SUMMER 2018

Subject Code: 640003   **Date: 24-May-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.1 **(a)** What is Operations Research? Explain the advantages of Operations Research.   **07**
(b) Write the dual of the following primal LP problem   **07**
Max $Z = 3x_1 + x_2 + 2x_3 - x_4$
Subject to
    (i) $2x_1 - x_2 + 3x_3 + x_4 = 1$
    (ii) $x_1 + x_2 - x_3 + x_4 = 3$
and $x_1, x_2, x_3, x_4 \geq 0$

Q.2 **(a)** Use the following simplex method to solve the following LP problem.   **07**
Max $Z = 3x_1 + 5x_2 + 4x_3$
Subject to
    (i) $2x_1 + 3x_2 \leq 8$
    (ii) $2x_2 + 5x_3 \leq 10$
    (iii) $3x_1 + 2x_2 + 4x_3 \leq 15$
and $x_1, x_2, x_3 \geq 0$

(b) Anita Electric company produces two products P1 and P2. Products are produced and sold on a weekly basis. The weekly production cannot exceed 25 for product P1 and 35 for product P2 because of limited available facilities. The company employs total of 60 workers. Production P1 requires 2 man-weeks of labour, while P2 requires 1 man-week of labour. Profit margin on P1 is Rs. 60 and on P2 is Rs 40. Formulate this problem as an LP problem and solve for maximum profit.   **07**

OR

(b) A television repairman finds that the time spent on his jobs has an exponential distribution with a mean of 30 minutes. If he repairs the sets in the order in which they came in, and if the arrival of sets follows a poisson distribution with an approximate average rate of 10 per 8-hour day, what is the repairman's expected idle time each day? How many jobs are ahead of the average set just brought in?   **07**

Q.3 **(a)** What is simulation? Explain the advantages and disadvantages of simulation.   **07**
(b) A project has the following times scheduled   **07**

Activity	1-2	2-3	2-4	3-5	3-6	4-5	4-7	5-8	6-8	7-8
Duration	3	9	11	7	4	4	8	6	3	9

Draw an arrow diagram.
Indicate the critical path.
For each activity calculate total and free float.

OR

Q.3 **(a)** Define inventory. Discuss various cost involved in inventory.   **07**
(b) The Winner Publishing Company employs typists on hourly basis. There are five typists for service and their charges and speeds are different. According to an earlier understanding only one job is given to one typist and the typist is paid for full hour even if he works for a fraction of an hour. Find the least cost   **07**

allocation for the following data:

Typist	Rate per hour (Rs.)	No. of pages Typed / hour
A	5	12
B	6	14
C	3	8
D	4	10
E	4	11

Job	No. of pages
P	199
Q	175
R	145
S	198
T	178

Q.4 **(a)** Explain Hungarian method in detail. **07**

(b) Determine an initial basic feasible solution to the following transportation problem by using (a) NWCM (b) VAM **07**

Product	Warehouse				
	D1	D2	D3	D4	Supply
S1	19	30	50	10	7
S2	70	30	40	60	9
S3	40	8	70	20	18
Demand	5	8	7	14	

OR

Q.4 **(a)** Explain Johnson's procedure for determining an optimal sequence for processing n items on two machines. **07**

(b) Find the range of values of p and q that will render the entry (2,2) a saddle point for the game. **07**

Player A	Player B		
	B1	B2	B3
A1	2	4	5
A2	10	7	q
A3	4	p	6

Q.5 **(a)** Explain the difference between PERT and CPM. **07**

(b) Solve the following sequencing problem, giving an optimal solution when passing is not allowed, and also find idle time for all machines. **07**

Machine	Job				
	A	B	C	D	E
M1	11	13	9	16	17
M2	4	3	5	2	6
M3	6	7	5	8	4
M4	15	8	13	9	11

OR

Q.5 **(a)** What is replacement? Explain types of failure. **07**

(b) A manufacturer has to supply his customer with 600 units of his product per year. Shortages are not allowed and the storage cost amounts to Rs. 0.60 per unit per year. The set-up cost per run is Rs 80.00 .Find the optimum run size and the minimum average yearly cost. **07**

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