# GIET UNIVERSITY, GUNUPUR – 765022
### M. C. A (Third Semester) Examinations, December' 2020
## MCA305 – Quantitative Techniques (OR & SM)

Time: 2 hrs            Maximum: 50 Marks

**The figures in the right hand margin indicate marks.**

### PART – A    (2 x 10 = 20 Marks)

Q.1. Answer *ALL* questions

a. Write the components of Linear Programming Problem.

b. Define Artificial variable.

c. Define Unbalanced Assignment problem.

d. Write the advantages of Duality in Linear Programming problem.

e. Define the critical Path in Network Analysis.

f. Write the types of events.

g. Explain the notation $(M/M/1)(\infty/FCFS)$

h. Define Balking, Reneging in the Queuing theory

i. Write the objective of the replacement models problems.

j. Write any two advantages of simulation models.

### PART – B    (6 x 5 = 30 Marks)

Answer *ANY FIVE* questions          Marks

2. Use revised simplex method to solve $Max\ Z = 3x_1 + 5x_2$ subject to $x_1 \leq 4, x_2 \leq 6, 3x_1 + 2x_2 \leq 18$ , $x_1, x_2 \geq 0$.     (6)

3. Use Dual simplex method to solve $Max\ Z = 20x_1 + 10x_2 + 15x_3$ subject to $8x_1 + 6x_2 + 2x_3 \leq 60, 5x_1 + x_2 + 6x_3 \geq 40, 2x_1 + 6x_2 + 3x_3 \leq 30, x_1, x_2, x_3 \geq 0$.     (6)

4. A project consists of the following activities and time estimates(weeks)     (6)

| Activities | 1 − 2 | 1 − 3 | 1 − 4 | 2 − 5 | 3 − 5 | 4 − 6 | 5 − 6 |
|---|---|---|---|---|---|---|---|
| $t_o$ | 1 | 1 | 2 | 1 | 2 | 2 | 3 |
| $t_m$ | 1 | 4 | 2 | 1 | 5 | 5 | 6 |
| $t_p$ | 7 | 7 | 8 | 1 | 14 | 8 | 15 |

    i)     Draw the network
    ii)     Find the expected project duration and variance
    iii)     What is the probability that the project will be completed in atleast 3 weeks than expected.

5. Apply MODI method to obtain the optimal solution of transportation problem     (6)

| | $D_1$ | $D_2$ | $D_3$ | $D_4$ | Availability |
|---|---|---|---|---|---|
| $S_1$ | 5 | 3 | 6 | 2 | 19 |
| $S_2$ | 4 | 7 | 9 | 1 | 37 |
| $S_3$ | 3 | 4 | 7 | 5 | 34 |
| Requirement | 16 | 18 | 31 | 25 | |

6. The arrival rate of customers at a banking counter follows poisson distribution with a mean of 45 per hour. The service rate of the counter clerk also follows poisson distribution with mean of 60 per hour. i) what is the probability having zero customers in the system. ii) find $L_s$, $L_q$, $W_s$ and $W_q$.    (6)

7. The initial cost of a machine is Rs. 6100/- and its scrap value is Rs.100/-. The maintenance costs found from experience are as follows:    (6)

| year | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|------|-----|-----|-----|-----|-----|------|------|------|
| Annual maintenance cost in Rs. : | 100 | 250 | 400 | 600 | 900 | 1200 | 1600 | 2000 |

   When should the machine be replaced

8. The Lajwaab Bakery Shop keeps stock of a popular brand of cake. Previous experience indicates the daily demand as given below:    (6)

| Daily Demand | 0 | 15 | 25 | 35 | 45 | 50 |
|--------------|------|------|------|------|------|------|
| Probability | 0.01 | 0.15 | 0.20 | 0.50 | 0.12 | 0.02 |

   Consider the following sequence of random numbers:
   21, 27, 47, 54, 60, 39, 43, 91, 25, 20

   Using this sequence, simulate the demand for the next 10 days. Find out the stock situation, if the owner of the bakery shop decides to make 30 cakes every day. Also estimate the daily average demand for the cakes on the basis of simulated data.

   --- End of Paper ---