Roll No. | | | | | | | | | | |

B.E / B.Tech (FT) END SEMESTER EXAMINATIONS – APRIL / MAY 2019

MANUFACTURING ENGINEERING
Seventh Semester

MF8751 Operation Research
(Regulation 2012)

Time: 3 Hours | Answer ALL Questions | Max. Marks 100

PART-A (10 x 2 = 20 Marks)

1. What are the advantages of linear programming?
2. What is the purpose of sensitivity analysis?
3. Mention the use of MODI method.
4. What is the difference between a sequence and a schedule?
5. Give a graphical representation of a manufacturing model with shortage.
6. Differentiate between deterministic and stochastic inventory models.
7. What does Kendall's notation represent?
8. What are the advantages of simulation?
9. What is a mixed strategy in game theory?
10. State few merits of dynamic programming technique.

Part – B (5 x 16 = 80 marks)
(Question No.11 is Compulsory)

11. Solve the following linear programming:

Maximize $Z = 27x_1+29x_2+25x_3$

Subject to the constraints

$27x_1+12x_2+12x_3 \leq 162$

$27x_1+15x_2+25x_3 \leq 189$

$3x_2 \leq 14$

$x_1, x_2, x_3 \geq 0$

12. a) A manufacturer has distribution centres at X, Y and Z. these centres have availability 4020 and 40 units of his product. His retail outlets at A, B, C, D and E requires 25,10,20,30 and 15 units respectively. The transport cost (in rupees) per unit between each centre outlet is given below:

Distribution centre	Retail outlets				
	A	B	C	D	E
X	55	30	40	50	50
Y	35	30	100	45	60
Z	40	60	95	35	30

Determine the optimal distribution to minimize the cost of transportation.

(OR)

PTO)

b) A small maintenance project consists of the following twelve jobs whose precedence relations are identified with their node numbers:

Job(i,j)	(1,2)	(1,3)	(1,4)	(2,3)	(2,5)	(2,6)
Duration (in days)	10	4	6	5	12	9
Job(i,j)	(3,7)	(4,5)	(5,6)	(6,7)	(6,8)	(7,8)
Duration (in days)	12	15	6	5	4	7

Draw an arrow diagram representing the project and calculate the earliest start, earliest finish, latest start and latest finish time for all the jobs.
Find the critical path and project duration. Tabulate total float, free float and independent float.

13. a)i A company has a demand of 12,000 units/year for an item and it can produce 2000 such items per month. The cost of one setup is Rs. 400 and the holding cost / unit /month is Rs 0.25. Find the optimum lot size, max inventory, manufacturing time and the total time. (12)

ii Write notes on factors that affect the inventory control. (4)

(OR)

b) Find the optimal order quantity for which the price breaks are as follows:

Quantity	Unit Cost
$0 \le q_1 < 500$	Rs 10/-
$500 \le q_2 < 750$	Rs 9.25/-
$750 \le q_3$	Rs 8.75/-

The monthly demand for the product is 200 units, shortage cost is 2% of the unit cost and the cost of ordering is Rs 100.

14. a) Arrivals at a telephone booth are considered to be Poisson with an average time of 12 minutes between one arrival and the next. The length of a phone call is assumed to be distributed exponentially with mean 4 minute.

Find the average number of persons waiting in the system. What is the probability that it will take him more than 10 minutes altogether to wait in the queue.

What is the probability that it will take him more than 10 minutes altogether to wait for a phone and complete his call?

Estimate the fraction of the day when the phone will be in use.

The telephone department will install a second booth when convinced that an arrival has to wait on the average for at least 3 minutes for the phone. By how much should the flow of arrivals increase in order to justify a second booth?

What is the average length of the queue that forms from time to time?

(OR)

b)i Write notes on queuing disciplines. (4)

ii A car park contains 5 cars. The arrival of cars is Poisson at a mean rate of 10 per hour. The length of time each car spends in the car park is negative exponential distribution with mean of 2 hours. How many cars are in the park on an average? (12)

15. a)i Solve the following rule by dominance rules: (12)

	B_1	B_2	B_3
A_1	1	7	2
A_2	6	2	7
A_3	5	1	6

ii Write detailed notes on replacement models. (4)

(OR)

b) Solve the problem by dynamic programming technique.

Minimize $Z = x_1^2 + x_2^2 + x_3^2$

Subject to the constraints

$x_1 + x_2 + x_3 \geq 15$

$x_1, x_2, x_3 \geq 0$