(6 pages)

MAY 2014 **P/ID 77731/MBN4D**

Time : Three hours Maximum : 100 marks

PART A — (5 × 6 = 30 marks)

Answer any FIVE questions.

1. What are the important features of Operations Research? Describe in detail the different phases of Operations Research.

2. Describe the steps involved in determining the slack variable? Why is it needed?

3. Describe the different models of a queuing system. Give examples.

4. Discuss the application of quantitative methods in inventory control and purchasing.

5. Explain the two person zero sum game with suitable illustrations.

6. What are the general assumptions made to solve the sequencing problems?

7. Explain how CPM is used for making business decisions?

8. Past records indicate that of the five machines that a factory owns, breakdowns occur at random and the average time between the breakdowns is two days. Assuming that the repairing capacity of the workman is one machine a day and the repairing distributed exponentially, determine the expected length of a queue.

PART B — (5 × 10 = 50 marks)

Answer any FIVE questions.

9. In a textile sales emporium, four salesmen A, B, C, D are available at four counters W, X, Y, Z. Each salesman can handle any counter. The service (in hour) of each counter when manned by each salesman is given below :

	Salesman			
Counter	A	B	C	D
W	41	72	39	52
X	22	29	49	65
Y	27	39	60	51
Z	45	50	48	52

How should the salesman be allocated appropriate counters so as to minimize the service time? Each salesman must handle only one counter.

10. The network information is as follows. A is the first activity and precedes B and C: D succeeds both Band C: whereas only c is required to start E. D precedes F; while G succeeds E. H is the last activity and succeeds F and G. further information is provided below:

Activity	Duration (in week)		
	Optimistic	Most likely	Pessimistic
A	1	2	3
B	2	2	8
C	6	7	8
D	1	2	3
E	1	4	7
F	1	5	9
G	1	2	3
H	1	2	9

(a) Find the expected duration and variance of each activity.

(b) Identify critical path and expected project completion time.

(c) What is the probability of completing the project on or before 25 weeks?

(d) If the probability of completing the project is 0.8, find the expected project completion time.

11. There is congestion in the platform of a railway station. The train arrives at the rate of 30 trains per day. The waiting time for any train is exponentially distributed with an average of 36 minutes. Calculate the mean queue size and the probability of that queue size exceeds 10.

12. Determine the optimal sequencing of jobs from the following data and obtain the value of T, the total elapsed time involved :

Job :	1	2	3	4	5	6	7	8
Machine M1 :	7	3	6	8	9	5	4	3
Machine M2 :	8	8	2	4	7	5	6	8

Processing order for all jobs is $M_1 - M_2$.

13. For the following two person zero-sum game, find the optimal strategy for each player and the value of the game.

		Player B			
		B1	B2	B3	B4
	A1	0	–1	3	5
Player A	A2	–5	2	4	5
	A3	–2	–3	–4	–2

14. Solve the following LPP using simplex method :

Minimize Z = $x_1 + x_2$

Subject to constraints :

$2x_1 + 4x_2 \leq 4;$

$x_1 + 7x_2 \leq 7;$

$x_1, x_2 \geq 0$

15. At a one-man beauty parlour, customers arrive according to Poisson distribution with a mean arrival rate of 5 per hour and the hair dressing time is exponentially distributed with an average hair dressing taking 10 minutes. It is assumed that because of the excellent reputation, customers are willing to wait. Calculate the following :

(a) Average number of customer in the shop and the average number of customer waiting for hair dressing.

(b) The percentage of customers who have to wait prior to getting into the dressing chair.

16. A purchase manager places order each time for a lot of 500 units of a particular item. From the available data the following results are obtained:

Inventory carrying cost = Rs. 50

Ordering cost per order = Rs. 600

Cost per unit = Rs. 50

Annual demand = 1000 units.

Find out profit/loss to the organisation due to the ordering policy. Is the ordering policy adopted correct? Justify.

PART C — (1 × 20 = 20 marks)

Compulsory.

17. (a) For a small project of 12 activities, the details are given below. Draw the network and compute earliest occurrence time, latest occurrence time, critical activities and project completion time:

Activity :	A	B	C	D	E	F	G	H	I	J	K	L
Dependence :	–	–	–	B,C	A	C	E	E	D, F,.H	E	I, J	G
Durations (days) :	9	4	7	8	7	5	10	8	6	9	10	2

(b) List down the merits and demerits of PERT.

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