



- Notes :
1. All questions carry marks as indicated.
  2. Solve Question 1 OR Questions No. 2.
  3. Solve Question 3 OR Questions No. 4.
  4. Solve Question 5 OR Questions No. 6.
  5. Solve Question 7 OR Questions No. 8.
  6. Solve Question 9 OR Questions No. 10.
  7. Solve Question 11 OR Questions No. 12.
  8. Due credit will be given to neatness and adequate dimensions.
  9. Assume suitable data whenever necessary.
  10. Illustrate your answers whenever necessary with the help of neat sketches.
  11. Use of non programmable calculator is permitted.
  12. Use of normal distribution table is allowed.
  13. Use of Random number table is allowed.

1. A firm manufactures two types of furniture: Chairs and tables. The profit contribution from each product as calculated by the accounting department is Rs. 20 per chair and Rs. 30 per table. Both products are processed on three machines  $M_1$ ,  $M_2$  &  $M_3$ . The time required by each product and total time available per week on each machine are as follows: 14

Machine	Chair	Table	Available hours per week
$M_1$	3	3	36
$M_2$	5	2	50
$M_3$	2	6	60

How should the manufacturer schedule his production in order to maximize profit?

**OR**

2. Solve using simplex method  
Maximize 14

$$Z = x_1 + 2x_2 + 3x_3$$

Subject to,

$$x_1 - x_2 + x_3 \geq 4,$$

$$x_1 + x_2 + 2x_3 \leq 8$$

$$x_1 - x_3 \geq 2$$

$$x_1, x_2, x_3 \geq 0$$

3. Assign the supervisor to work Centres such that the total efficiency is maximized. The efficiency matrix is given in table. 13

Work centre	1	2	3	4	5	6
Supervisor						
1	0.92	0.95	0.90	0.85	0.75	0.91
2	0.94	0.90	0.88	0.85	0.95	0.93
3	0.75	0	0.77	0.70	0	0.76
4	0.88	0.85	0.90	0.80	0.85	0.90
5	0.55	0.95	0.90	0.94	0.95	0.90
6	0.50	0.75	0.74	0.80	0.80	0

**OR**

4. A company has three plants A, B and C and three warehouses P, Q and R. The transportation cost per unit, demand of each warehouse and capacity of each plant are as given in the table below. Find the optimum transportation plan. 13

WAREHOUSES (Transportation cost (Rs.))

		P	Q	R	Capacity
PLANT	A	50	80	100	400
	B	22	90	40	500
	C	70	100	55	300
DEMAND →		400	400	400	

5. a) Five jobs are performed first on machine  $M_1$  and then on machine  $M_2$ . Time in hours taken by each job on each machine is given below. 6

Determine the optimum sequence of jobs and the minimum time elapsed

Machines/Jobs -	A	B	C	D	E
$M_1$	5	1	9	3	10
$M_2$	2	6	7	8	4

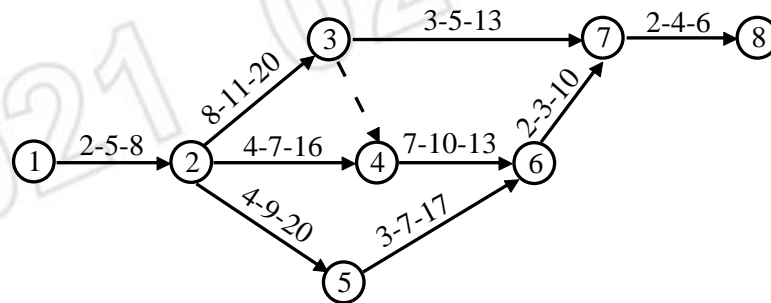
- b) A company requires 16000 units of raw material costing Rs. 2 per unit. The cost of placing an order is Rs. 45 and the carrying costs are 10% per year per unit of the average inventory. Determine : i) The economic order quantity, ii) cycle time, iii) total variable cost of managing the inventory. 7

OR

6. Consider the following pay off matrix for two firms. Find the best strategies for both the firms: 13

		FIRM (II)		
		No advertising	Medium advertising	Large advertising
FIRM (I)	No adv.	60	50	40
	Med. adv.	70	70	50
	Large adv.	80	60	75

7. Figure shows the network for a construction project, with the three time estimates of each activity marked. Determine (a) critical path (b) Probability of completion of project in 40 days. (c) Time duration that will provide 95% probability of its completion. 14



OR

8. The following data pertains to some network compress the project to the least possible duration and estimate the crashing cost. **14**

Activities	Normal Time	Crash Time	Cost slope
1-2	3	2	700
1-3	7	4	200
2-3	5	3	100
2-4	8	6	200
3-4	4	2	400

9. An engineering company is offered material handling equipment- 'A' • 'A' is purchased for Rs. 80,000/- originally and maintenance costs are estimated to be Rs. 12,000/- for first five years and increasing every year by Rs 3,200/- from sixth and subsequent years. The company expert a return of 10% on all it's investment. What is the optimum replacement period? **13**

**OR**

10. A computer contains 10,000 resistors. When any resistor fails it is replaced. The cost of replacing a resistor individually is Rs. 1 only. If all the resistors are replaced at the same time, the cost per resistor would be reduced to 35 paise. The percent surviving at the end of month 't' is given in table below. What is optimum period of replacement. **13**

Month	:	0	1	2	3	4	5	6
% surviving at the end of month (t)	:	10	97	90	70	30	15	0

11. The waiting line with mean arrival rate of 6 min and mean service rate of 5 min has probability distribution for arrival and service are as follow. **13**

Arrival time (min)	3	4	5	6	7	8
Probability	0.02	0.2	0.3	0.3	0.1	0.08

Service time (min)	3	4	5	6	7
Probability	0.1	0.2	0.4	0.28	0.02

Simulate for 10 arrivals and determine the average waiting time of arrival and average queue length

Random No Arrival :-	09,	41	74	50	72	67	55	71	35	41
Service :-	72	34	54	30	22	48	74	76	02	07

**OR**

12. Patrons arrive at a reception counter at an average inter arrival rate of 2 minutes. The receptionist on duty take an average of 1 min. per patron. **13**
- What is the chance that a patron will straight way meet the receptionist?
  - For what portion of time the receptionist is busy?
  - What is the average queue length?
  - What is the average number. of patrons in the system?
  - What is the average waiting time of patron?
  - What average time a patron spends in the system.
  - Suppose management wants to keep a second receptionist when the average waiting time of an arrival exceeds 1.5 minutes. Find what should be the average inter-arrival time to justify a second receptionist?

\*\*\*\*\*

