

**BURSA**

TIME : 2 hrs.

MARK : 50

- Instruction :**
- 1) Attempt all questions
  - 2) Figures to the right indicate marks.
  - 3) Use of statistical tables is allowed.

- Q.1 a) What is an assignment problem? Explain Hungarian method of solving an assignment problem. 06
- b) A Marketing manager has 5 salesman and 5 sales districts. Considering the capabilities of the salesman and the nature of districts, the marketing manager estimates that sales per month (in hundred rupees) for each salesman in each district would be as follows :

Salesman / District	A	B	C	D	E
1	32	38	40	28	40
2	40	24	28	21	36
3	41	27	33	30	37
4	22	38	41	36	36
5	29	33	40	35	39

Find the assignment of salesman to districts that will result in a maximum sale. 06

**OR**

- Q.1 a) What is an unbalanced assignment problem? How is the Hungarian method applied for obtaining a solution if the matrix is rectangular? 06
- b) ABC Company is engaged in manufacturing 5 brands of packed snacks. It is having five manufacturing setups, each capable of manufacturing any of its brands, one at a time. The cost to make a brand on these setups vary according to the following table :-

	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	S <sub>4</sub>	S <sub>5</sub>
B <sub>1</sub>	4	6	7	5	11
B <sub>2</sub>	7	3	6	9	5
B <sub>3</sub>	8	5	4	6	9
B <sub>4</sub>	9	12	7	11	10
B <sub>5</sub>	7	5	9	8	11

Assuming 5 setups are S<sub>1</sub>, S<sub>2</sub>, S<sub>3</sub>, S<sub>4</sub>, S<sub>5</sub> and 5 brands are B<sub>1</sub>, B<sub>2</sub>, B<sub>3</sub>, B<sub>4</sub>, B<sub>5</sub> find optimum assignment of products on these setups resulting in the minimum cost. 06

- Q.2 a) Explain what do you mean by a sequencing problem. Give three examples sequencing problem from your daily life. 06
- b) We have seven jobs each of which has to go through the machine M<sub>1</sub> and M<sub>2</sub> in the order M<sub>1</sub> M<sub>2</sub>. Processing times (in hours) are given as :

Job	1	2	3	4	5	6	7
Machine M <sub>1</sub>	3	12	15	6	10	11	9
Machine M <sub>2</sub>	8	10	10	6	12	1	3

Determine a sequence of these jobs that will minimize the total elapsed time T. 06

**OR**

- Q.2 a) Explain Johnson's method for determining the optimal sequence for processing n jobs on two machines. 06
- b) Find the sequence for the following six jobs, that will minimize the total elapsed time for the total elapsed time for the completion of all the jobs. Each job is processed in the order ABC.

- Q.3 a) What is float? What are different types of floats? 06  
 b) A project schedule has the following characteristics -

Activity	Time	Activity	Time
1 - 2	2	4 - 8	8
1 - 4	2	5 - 6	4
1 - 7	1	6 - 9	3
2 - 3	4	7 - 8	3
3 - 6	1	8 - 9	5
4 - 5	5		

- i) Construct a PERT network.  
 ii) Compute Earliest and Latest time for each event.  
 iii) Float for each activity.  
 iv) Critical path and its duration. 07

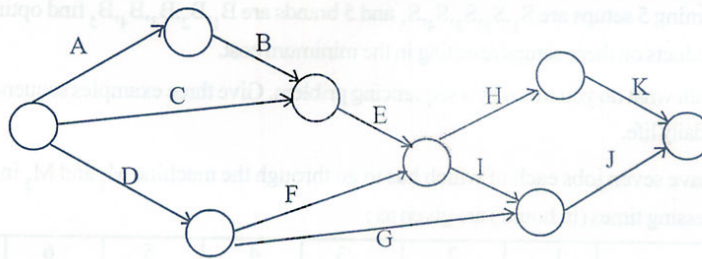
OR

- Q.3 a) Explain the following terms in PERT -  
 i) Optimistic time  
 ii) Normal time  
 iii) Pessimistic time  
 iv) Expected time  
 v) variance for the activity. 0

- Q.3 b) For the project represented by the network diagram, find the earliest and latest times to reach each node, given the following data -

Task :	A	B	C	D	E	F	G	H	I	J	K
Least time :	4	5	8	2	4	6	8	5	3	5	6
Greatest time :	8	10	12	7	10	15	16	9	7	11	13
Most likely time :	5	7	11	3	7	9	12	6	5	8	9

Also find the critical path and its duration. Obtain Total float and free float for each activity.



- Q.4 a) Explain briefly errors in drawing network.  
 b) A project has the following activities and other characteristics

Activity	Immediate	Duration (weeks)		
	Predecessor	Optimistic	Most likely	Pessimistic
A	—	4	7	16
B	—	1	5	15
C	A	6	12	30
D	A	2	5	8
E	C	5	11	17

- i) Draw the PERT network diagram
- ii) Find the expected duration & variance for each activity. What is the expected project length?
- iii) Calculate the variance and standard deviation of the project length.
- iv) Claculate the probability of completing the project in 36 weeks.

**OR**

- Q.4 a) Explain Furkerson’s forward and backward rule to find earliest start and latest finish time in a network
- b) The following table given the activities and other relevant data for the project.

Activity	Normal time(days)	Crash time(days)	Normal Cost (Rs.)	Crash Cost (Rs.)
1 - 2	4	3	6000	8000
1 - 3	2	2	4000	4000
1 - 4	5	4	7500	9000
2 - 3	7	5	4000	6000
2 - 5	7	6	8000	10000
3 - 5	2	1	5000	6500
4 - 5	5	4	6000	8500

Indirect cost per day of the project is Rs.2000.

- i) Draw the network of the project.
- ii) Find the normal duration and cost of the project.
- iii) Find the optimal duration and cost of the project.

