

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

- Q.1 a)** Explain briefly an assignment problem. Explain Hungarian method of solving an assignment problem. 6
- b)** In a job shop operation five jobs may be performed on any of four machines. The hours required for each job on each machine are presented in the following table.

| | Machine | | | |
|-------|---------|----|----|----|
| | 1 | 2 | 3 | 4 |
| A | 13 | 14 | 16 | 10 |
| B | 12 | 13 | 15 | 12 |
| Job C | 11 | 12 | 12 | 9 |
| D | 16 | 16 | 18 | 14 |
| E | 10 | 12 | 13 | 12 |

The plant forman would like to assign the jobs so that the total time is minimized find the optimal solution. Which job will be left unassigned ? 6

OR

- Q.1 a)** How will you solve an assignment situation in an assignment problem
i) maximization ii) unbalanced problem. 6
- b)** A project work consists of four major jobs for which four contractors have submitted tenders. The tender amounts quoted in thousands of rupees are given in the adjoining matrix.
Find the assignment which minimizes total cost of the project. Each contractor has to be assigned one job.

| | Jobs | | | |
|----------------|----------------|----------------|----------------|----------------|
| Contractors | J ₁ | J ₂ | J ₃ | J ₄ |
| C ₁ | 15 | 29 | 35 | 20 |
| C ₂ | 21 | 27 | 33 | 17 |
| C ₃ | 17 | 25 | 37 | 15 |
| C ₄ | 14 | 31 | 39 | 21 |

- Q.2 a)** What is sequencing problem ? Explain and illustrate. Give three examples from your daily life. 6
- b)** Six jobs go first over machine I and then over machine II and machine III. The time required to perform these operations for each job is known.

| Job | 1 | 2 | 3 | 4 | 5 | 6 |
|-------------|----|----|---|----|---|----|
| Machine I | 3 | 12 | 5 | 2 | 9 | 11 |
| Machine II | 8 | 6 | 4 | 6 | 3 | 1 |
| Machine III | 13 | 14 | 9 | 12 | 8 | 13 |

Determine the order in which the job should be processed in order to minimise the total time required to turn out all the jobs. Find also idle time for each machine. 6

OR

Q.2 a) Give Johnson's procedure for determining an optimal sequence for processing n items on two machines. Give the justification of rule in the procedure. 6

b) A book binder has one printing press one binding machine and manuscripts of number of book. The time required to perform printing and binding operations on each book are shown below.

| Book | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|--------------|----|----|----|----|-----|----|----|
| Binding time | 20 | 90 | 80 | 20 | 120 | 15 | 65 |
| Binding time | 25 | 60 | 75 | 30 | 90 | 35 | 50 |

Determine the order in which the books should be processed, so that total time required to process all books is minimized. 6

Q.3 a) Compare PERT and CPM. Under what circumstances would you use PERT as opposed to CPM in project management ? 6

b) A small project of seven activities for which the relevance data are given below.

| Activity | Preceding Activity | Activity duration |
|----------|--------------------|-------------------|
| A | --- | 4 |
| B | --- | 7 |
| C | --- | 6 |
| D | A,B | 5 |
| E | A,C | 7 |
| F | C,D,E | 6 |
| G | C,D,E | 5 |

- i) Draw network and find the project completion time
- ii) Calculate total float for each activity. 7

OR

Q.3 a) Explain the following term with respect to PERT /CPM
 i) Three time estimates in PERT ii) Earliest start time, Latest finish time.
 iii) Critical path. 6

b) A small project is composed of eight activities whose time estimates are given below :

| Activity | Pessimistic time | Most likely time | Optimistic time |
|----------|------------------|------------------|-----------------|
| 1-2 | 21 | 7.5 | 3 |
| 1-3 | 27 | 8 | 3 |
| 2-4 | 8 | 8 | 8 |
| 2-5 | 3.5 | 2 | 0.5 |
| 3-5 | 10 | 10 | 10 |
| 4-5 | 1.7 | 1 | 0.3 |
| 4-6 | 9 | 7.5 | 3 |
| 5-6 | 5 | 3 | 1 |

- i) Draw the project network and identify all paths through it.
- ii) What is expected project completion time ? 7

Q.4 a) Explain the following :
 i) Total float ii) Free float iii) independent float. 6

b) A small assembly plant assembles PCs through 9 interlined stages according to adjoining precedence / process.

| Activity | time | Activity | time |
|----------|------|----------|------|
| 1-2 | 2 | 6-9 | 5 |
| 1-3 | 2 | 7-8 | 4 |
| 1-4 | 1 | 8-9 | 3 |
| 2-5 | 4 | | |
| 3-6 | 8 | | |
| 3-7 | 5 | | |
| 4-6 | 3 | | |
| 5-8 | 1 | | |

- i) Draw an arrow diagram (network) representing above assembly work.
- ii) Calculate earliest start, earliest finish, latest start latest finish time at all the stages.
- iii) Find the critical path.
- iv) Calculate total float. 7

OR

Q.4 a) Explain briefly errors in drawing network. 4

b) The following table gives 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. 9
