



Seat No. _____

HH-19BBA609

B. B. A. (Sem. VI) (CBCS) (W.E.F. 2019) Examination

April - 2023

Statistics

(Advanced Operations Research Techniques) (New Course)

Time : $2\frac{1}{2}$ Hours / Total Marks : 70

- Instructions :** (1) All questions are compulsory.
(2) Marks are indicated on right side.

- 1 (a) How network diagram representation is done? **10**
(b) What are the various rules required for drawing a network diagram? **10**

OR

- 1 KA publisher has just signed a contract for publication of a book. **20**
What is the earliest time by which the book can be ready for distribution?

| Activity | A | B | C | D | E | F | G | H | I | J |
|------------------------------------|----|---|------|----|------|---|---|------|------|------|
| Predecessor Activity | - | - | A, B | A | C, D | E | E | C, D | F, G | I, H |
| Most likely time (T_M) in week | 8 | 2 | 2 | 6 | 4 | 3 | 4 | 6 | 8 | 1 |
| Optimistic time (T_O) in week | 4 | 2 | 1 | 4 | 3 | 3 | 3 | 4 | 6 | 1 |
| Pessimistic time (T_P) in week | 10 | 2 | 3 | 12 | 5 | 3 | 5 | 9 | 16 | 1 |

- (1) Find the critical path and calculate expected length and variance of critical path.
(2) What is the prob. that the length of project does not exceed 36 weeks?
- 2 (a) What is sequential problem? State terminology and assumptions of sequential problem. **10**
(b) Give 3 different examples of sequencing problems from your daily life. **10**

OR

- 2 Given following data : 20

| | | Job | | | | | |
|----------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| | | J ₁ | J ₂ | J ₃ | J ₄ | J ₅ | J ₆ |
| Machines | M ₁ | 12 | 10 | 9 | 14 | 7 | 9 |
| | M ₂ | 7 | 6 | 6 | 5 | 4 | 4 |
| | M ₃ | 6 | 5 | 6 | 4 | 2 | 4 |

(Machine Time in Hours)

- (1) Sequence suggested for the jobs J₅, J₃, J₆, J₂, J₁, J₄. Determine the total elapsed time for the suggested sequence.
- (2) Is the given sequence optimal? If not determine the optimal sequence, and calculate total elapsed time, idle time on each machine. If the order of processing each job is M₁, M₂, M₃.
- 3 What do you understand by an assignment problem? Give the brief outline of solving it. 15

OR

- 3 A departmental head has 4 subordinates, and 4 tasks to be performed. The subordinates differ in efficiency and the task differ in their intrinsic difficulty. His estimate of the time each man would take to perform each task is given in the matrix below. 15

| | | Men | | | |
|-------|---|----------------|----------------|----------------|----------------|
| | | M ₁ | M ₂ | M ₃ | M ₄ |
| Tasks | A | 18 | 26 | 17 | 11 |
| | B | 13 | 28 | 14 | 26 |
| | C | 38 | 19 | 18 | 15 |
| | D | 19 | 26 | 24 | 10 |

How should the task be allocated, one to a man, so as to minimize the total man hours?

- 4 What is Replacement Problem? Describe some important replacement situations and policies. 15

OR

- 4 The cost of machine is Rs. 12,000 and its scrap value is Rs. 500, maintenance cost is found from experience which is as shown in the table below : 15

| Year | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|------------------------|-----|-----|-----|------|------|------|------|------|
| Maintenance Cost (Rs.) | 200 | 500 | 800 | 1200 | 1800 | 2500 | 3200 | 4000 |

When the machine should be replaced?