

www.FirstRanker.com

www.FirstRanker.com

| * E |
|---------|
| chi, |
| LIBRARY |

0{30 ©GE1N

15ME81

Eighth Semester B.C. Degree Examination, June/July 2019 Operations Research

Time: 3 hrs.

Max. Marks: 80

| | Tir | me: 3 hrs. Ma | ax. Marks: 80 |
|---|-----|--|--|
| | | Note: 1. Answer any FIVE full questions, choosing ONE full question from each module. | |
| . <u>@</u> | | 2. Use of statistical tables is permitted. | |
| . <u>∪</u> m. | | Module-1 | |
| i5_= i5_= i4 Fa C ² r0 t4 fa C ² r0 t4 fa C ² r0 t4 | 1 | a. List and explain briefly the phases of operations research. b. A paper manufacturing company produces two grades of papers grade `R Because of raw material restrictions, not more than 450 tonnes of grade R ar grade S papers can be produced per week. It requires 0.2 hours to produce 1 R paper and 0.4 hours to produce 1 tonne of grade S paper. There are 108 p per week. The profit per tonne of grade R paper is Rs 400 and per tonne of is Rs. 500. Formulate a mathematical model to determine how many tones grade S papers the company has to produce per week to maximize it graphically. | nd 240 tonnes of 1 tonne of grade production hours 5 grade S paper it of grade R and |
| PE | | OR | |
| P: E o ?: 4; = ^f , 4 <u>-</u> a | 2 | a. Discuss the limitations of operations research. b. Solve the following LPP by graphical method and indicate the solution : Maximize Z = 2x] + 3x2 Subject to constraints : xi - 2x, 0 2x₁ - x2 0 x₁ - x, 0 with x1 x2 0 | (06 Marks) |
| • | | $x_1 - x_2 \dots 0$ | (10) |
| . m IrS -0 | | with x], x2 0. | (10 Marks) |
| | | <u>Module-2</u> | |
| ·, 1',- | 3 | a. What is the significance of introducing slack, surplus and artificial variables | |
| k,- 0. t.) ,: t.) ,: t.) ,: t. | | b. Solve the following LPP by Simplex Method : Maximize $Z = 6x_1 + 4x$, Subject to constraints: $-2x_1 + x2 \ 2$ $xi - xi \ 2$ 3x + 2x.) -9 | (04 Marks) |
| = 7:1 >, 1 | | with xi, x, $_$ O. | (12 Marks) |
| z, O tz to | | | (12 Marks) |
| | | ()R | |
|), O < , r; !) Z Z U | 4 | a. Solve the following LPP by either Big-M method or two phase method : Minimize Z = x₁ - 2x₂ - 3x₃ Subject to constraints : -2x1 + x2 + 3x3 = 2 2x₁ + 3x₂ + 4x₃ = 1 with x₁x₂, x₃ Q. b. Solve the following by Dual Simplex Method : Maximize Z = -2x₁ - 2x,4x₃ Subject to constrains: 2x₁ + 3x, + 5x₃ Q | (08 Marks) |
| | | $3x1 + x_2 + 7x33$ | |
| | | $x_1 + 4x_2 + 6x35$ | |
| | | with x_{\perp} , x_i , x_3 O. | (08 Marks) |
| | | | |

www.FirstRanker.com



www.FirstRanker.com

15ME81

Module-3

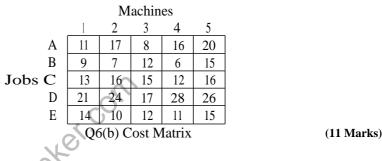
- 5 a. What is degeneracy in transportation problem? Discuss its consequence and how it is over come. (04 Marks)
 - b. Obtain the optimum solution to the following transportation problem to minimize the total transportation cost. Initial solution by Vogel's approximation method. (VAM).

| | |] | Destir | | | |
|--------|--------|------------------|--------|----|-----------|-------|
| | | D _i 1 | D2 | D3 | D4 | Suppl |
| | 01 | 42 | 48 | 38 | 37 | 16 |
| Origin | 02 | 40 | 49 | 52 | 51 | 15 |
| | 03 | 39 | 38 | 40 | 43 | 19 |
| | Demano | 18 | 9 1 | 11 | 16 | _ |

(12 Marks)

OR

6 a. Explain the differences between assignment problem and transportation problem. (05 Marks)
b. A small machine shop has five jobs to be assigned to five machines. The following matrix indicates the cost of assigning each of the five jobs to each of the five machines. Obtain the optimum assignment of jobs to machines, in order to minimize the total assignment cost.



Module-4

a. Explain the Kendall and Lee's notations for representing queuing models. (04 Marks)
b. A small project consists of activities from 'A' to 'I'. The following table indicates the precedence relationship among activities and the three time estimates — optimistic, most — likely and pessimistic time for each activity in days.

| <u> </u> | * | | | |
|----------|--------------|---------------------|-------------|-------------|
| Activity | Predecessor | Optimistic | Most likely | Pessimistic |
| Activity | Relationship | time t _o | time `tin' | time 1,' |
| A | | 2 | 5 | 8 |
| В | А | 6 | 9 | 12 |
| С | А | 6 | 7 | 8 |
| D | B, C | 1 | 4 | 7 |
| E | А | 8 | 8 | 8 |
| F | D, E | 5 | 14 | 17 |
| G | С | 3 | 12 | 21 |
| Н | F, G | 3 | 6 | 9 |
| I | Н | 5 | 8 | 11 |

- i) Draw the project network. Determine the expected time and variance for each activity
- ii) Obtain the total expected duration of the project and critical path
- iii) What is the probability of completing the project in 50 days?

. . .

(12 Marks)

2 of 3



www.FirstRanker.com

151\1E81

OR

8 a. For the following set of activities of a project, draw the network and obtain Early Start [ES], Early Finish [EF], Late Start [LS] and Late Finish [LF] for each activity. Also, indentify the critical path and projec ______

| Activity | Predecessor | Duration in days |
|----------|-------------|------------------|
| А | | 5 |
| В | А | 8 |
| С | А | 6 |
| D | С | 5 |
| E | B, D | 9 |

(08 Marks)

(08 Marks)

- b. The mean arrival rate to a service centre is 3 per hour. The mean service time is found to be 10 minutes per service. Assuming Poisson arrival and exponential service time, find :
 - i) Utilization factor for the service facility
 - ii) Probability of two units in the system
 - iii) Queue length
 - iv) Expected waiting time in the system

Module-5

Player B

-2

4

Player B $\begin{array}{c|c}
2 \\
\hline
3
\end{array}$

6

8

3

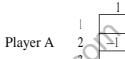
4

6

12

02

9 a. Apply the rules of dominance to reduce the game to (2×2) and solve the game to obtain game value and optimum strategies for both the players.



(08 Marks)

b. Solve the following (2 x 4) game graphically.

(08 Marks)

OR

Plaver A

 10
 a. There are seven jobs to be processed on a single machine. The following table indicates the jobs and corresponding processing time in hours. Obtain the optimum sequence of jobs by Shortest Processing Time [SPT] rule that minimizes the mean flow time. Also obtain average in process

 (06 Marks)

| Jobs (j) | Α | В | С | D | Е | F | G |
|--------------------------|---|---|---|---|---|---|---|
| Processing time (0 in hr | 8 | 3 | 5 | 4 | 3 | 9 | 6 |

b. There are six jobs to be processed on three machines A, B and C in the order CAB. The following table indicates the processing time in hours for the six jobs on the three machines. Obtain optimum sequence of jobs that minimizes the total elapsed time for completing all the jobs on the three machines. Also indicate the idle time of each machine.

| Jobs | 1 | 2 | 3 | 4 | 5 | 6 |
|-----------------------------------|---|----|---|---|----|---|
| Processing time in hours on M/C A | 4 | 6 | 7 | 4 | 5 | 3 |
| Processing time in hours on M/C B | 8 | 10 | 7 | 8 | 11 | 8 |
| Processing time in hours on M/C C | 5 | 6 | 2 | 3 | 4 | 9 |

(10 Marks)

rstRan

LL**3 of 3 ***