

**PSG COLLEGE OF ARTS & SCIENCE**  
(AUTONOMOUS)

**MSc DEGREE EXAMINATION DECEMBER 2018**  
(First Semester)

Branch – STATISTICS

**OPERATIONS RESEARCH**

Time: Three Hours

Maximum: 75 Marks

Answer ALL questions

ALL questions carry EQUAL marks

(5 x 15 = 75)

1 a Write a short note on post-optimal sensitivity analysis.

b Given the linear programming problem:

$$\text{Maximize } z=3x_1+5x_2$$

$$\text{Subject to } x_1+x_2 \leq 1, 2x_1+3x_2 \leq 1 \text{ and } x_1, x_2 \geq 0$$

Obtain the variations in  $c_j(j=1,2)$  which are permitted without changing the optimal solutions.

OR

c Explain the following terms:

(i) Setup Cost (ii) Lead Time (iii) Re-order point (iv) Time Horizon

d Find the optimum order quantity for a product for which the price breaks are as follows:

Quantity	Unit Cost (Rs.)
$0 \leq Q_1 \leq 500$	10.00
$500 \leq Q_2$	9.25

The monthly demand for a product is 200 units, the cost of storage is 2% of the unit cost and the cost of ordering is Rs.350.

2 a Write the computational procedure of dual simplex method of solving an LPP.

b Solve the following mixed-integer programming problem:

$$\text{Maximize } z=x_1+x_2 \quad \text{Subject to the constraints}$$

$$3x_1+2x_2 \leq 5, x_2 \leq 2, x_1, x_2 \geq 0 \text{ and } x_i \text{ an integer.}$$

OR

c What do you understand by decision-tree analysis? Explain its uses.

d A Manager has a choice between

(i) A risky contract promising Rs.7 lakhs with probability 0.6 and Rs.4 lakhs with probability 0.4 and

(ii) A diversified portfolio consisting of two contracts with dependent outcomes each promising Rs.3.5 lakhs with probability 0.6 and Rs.2 lakhs with probability 0.4. Construct a decision-tree for using EMV criteria. Can you arrive at the decision using EMV criteria?

3 a Distinguish between CPM and PERT.

b Draw the network for the data given below and compute:

(i) Critical Path

(ii) Total duration of the project.

Activity	1-2	1-3	2-4	3-4	4-5	4-6	5-7	6-7	7-8
Immediate Predecessor	-	-	1-2	1-3	2-4	2-4 & 3-4	4-5	4-6	6-7 & 5-7

3 Cont...

- d A small project is composed of seven activities whose time estimates (in weeks) are listed in the table as follows:

Activity	1-2	1-3	1-4	2-5	3-5	4-6	5-6
Optimistic Time	3	2	2	2	1	4	1
Most likely time	6	5	4	3	3	6	5
Pessimistic time	9	8	6	10	11	8	15

- (i) Draw the project network.  
 (ii) Find the expected duration and variance of each activity. What is the expected project length?  
 (iii) What is the probability that the project will be completed at least 4 weeks earlier than expected?
- 4 a List out the various characteristics of Dynamic Programming Problem.
- b Solve the following L.P.P by dynamic programming:  
 Maximize  $z=8x_1+7x_2$ ; Subject to the constraints  
 $2x_1+x_2 \leq 8$ ,  $5x_1+2x_2 \leq 15$  and  $x_1, x_2 \geq 0$ .
- OR
- c What is goal programming? Give the procedure of formulation of linear goal programming problem.
- d Explain the Simplex method for solving a goal programming problem with the necessary steps.
- 5 a State and prove Kuhn-Tucker necessary and sufficient conditions in non-linear programming.
- b Mention the four reasons for solving O.R problems by Simulation.
- OR
- c Write a brief note on various Simulation models.

- d A tourist car operator has 25 taxis in operation. He keeps three drivers as reserve to attend the calls, in case the scheduled drivers report sick. The probability distribution of sick drivers is as follows:

Number of Sick Drivers	0	1	2	3	4	5
Probability	0.20	0.25	0.20	0.15	0.12	0.08

Use the Monte-Carlo method to estimate the utilization of reserve drivers and the probability that at least one taxi will be off the road due to non-availability of a driver. Compare with the correct answers.

Z-Z-Z

END