18STU23

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2024
(Sixth Semester)

Branch – **STATISTICS**

OPERATIONS RESEARCH - II

Time: Three Hours Maximum: 50 Marks

SECTION-A (5 Marks)

Answer **ALL** questions
ALL questions carry **EQUAL** marks (5 x 1 = 5)

1. Define game involving n players is
   i) n Person game ii) Zero Sum game
   iii) Rectangular game iv) Mixed strategies

2. In which replacement policy, items arc replaced immediately after its failure
   i) Individual replacement policy ii) Mixed replacement policy
   iii) Group replacement policy iv) Double replacement policy

3. The representation of reality in some form of mathematical equation is
   i) Simulation ii) Queuing Theory
   iii) Game Theory iv) None of these.

4. In Queueing theory the arriving people are called
   i) Customers ii) Servers iii) Balking iv) Reneging

5. In Network Analysis, events are represented by
   i) Circle ii) Squares iii) Rectangles iv) None of the above

SECTION - B (15 Marks)

Answer **ALL** Questions
ALL Questions Carry **EQUAL** Marks (5 x 3 = 15)

6 a Solve the game whose payoff matrix is given by $\begin{pmatrix} 1 & 3 & 1 \\ 0 & -4 & -3 \\ 1 & 5 & -1 \end{pmatrix}$

OR

b Summarize the Maxmini — Minimax Principle in the game theory.

7 a Explain replacement problem and illustrate any two replacement situation.

OR

b The cost of a machine is Rs.6100 and its scrap value is Rs.100. The maintenance costs found from experience are given below:

Year	1	2	3	4	5	6	7	8
Maintenance cost (in Rs)	100	250	400	600	900	1200	1600	2000

When should the machine be replaced.

8 a Explain the different steps involved while solving a problem by Simulation.

OR

b A manufacturer company keeps steel of a special product previous experience indicates the daily as give below:

Daily Demand:	5	10	15	20	25	30
Probability:	0.01	0.20	0.15	0.50	0.12	0.02

Simulate the demand for the next 10 days. Also find the average daily demand on the basis of simulated data.

9. a Explain any two characteristics of Queueing system.

OR

b In a public telephone booth, the arrivals all on the average 15 per hour. A call on the average takes 3 minutes. If there is just one phone, find (i) Expected number of callers in the booth at any time and (ii) The proportion of the time the booth is expected to be idle?

Cont...

10. a Explain the three phases of a Project in a Network Analysis.

OR

b A Project is as follows:

Activity	A	B	C	D	E	F	G
Duration (in days)	4	9	3	8	7	2	5
Preceding activity	-	-	A	B	B	D	E

Construct the network and find the critical path and the project duration.

SECTION -C (30 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks (5 x 6 = 30)

11. a Using Dominance, solve the game whose payoff matrix is given by

$$\begin{pmatrix} 1 & 7 & 3 & 4 \\ 5 & 6 & 4 & 5 \\ 7 & 2 & 0 & 3 \end{pmatrix}$$

OR

b Solve the following game with 2 x 4 graphically.

$$\text{Player A} \begin{pmatrix} 1 & 0 & 4 & -1 \\ -1 & 1 & -2 & 5 \end{pmatrix} \quad \text{Player B}$$

12. a Explain to solve a replacement problem taking into account present worth factor and discount rate.

OR

b Let the value of the money be 10% per year and suppose that machine A is replaced after 3 years whereas machine B is replaced after every six years. The yearly cost of both machines are given below:

Age	1	2	3	4	5	6
Machine A	1000	200	400	1000	200	400
Machine B	1700	100	200	300	400	500

Determine which machine should be purchased?

13. a A tourist car operator finds that during the past few months the car's use has varied so much that the cost of maintaining the car varied considerably, During the past 200 days the demand for the car fluctuated as below:

Trips per week	Frequency
0	16
1	24
2	30
3	60
4	40
5	30

OR

b Explain Monte Carlo simulation technique with example.

14. a Summarise the Birth and Death model of Queueing theory?

OR

b In a Super market, the average arrival rate of customer is 10 in every 30 minutes following Poisson process. The average time taken by the cashier to list and calculate the customer's purchases is 2.5 minutes following exponential distribution.

i) What is the probability that the Queue length exceeds 6?

ii) What is the expected time spent by a customer in the system?

15. a A small project is composed of seven activities whose time estimates are given in the following table:

Activity	1-2	1-3	1-4	2-5	3-5	4-6	5-6
t_0	1	1	2	1	2	2	3
t_m	1	4	2	1	5	5	6
t_p	7	7	8	1	14	8	15

i) Draw the project network and identify all the paths through it.

ii) Determine the expected project length.

iii) Calculate the Standard deviation and variance of the project length.

OR

b The following table shows the jobs of a project with their duration in days. Draw the network and determine the critical path. Also calculate all the floats.

Activity	1-2	1-3	1-5	2-3	2-4	3-4	3-5	3-6	4-6	5-6
Duration (in weeks)	8	7	12	4	10	3	5	10	7	4

Z-Z-Z

END