PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

MCA DEGREE EXAMINATION MAY 2022
(Second Semester)

Branch – **COMPUTER APPLICATIONS**

OPERATIONS RESEARCH

Time: Three Hours Maximum: 75 Marks

SECTION-A (10 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** marks (10 x 1 = 10)

1 To obtain inequality constraints introduce _____ variables (Si's) for <= type of constraint.
(i) Stack (ii) Surplus
(iii) Artificial (iv) Slack

2 At any iteration in simplex method, the key number must be
(i) Zero (ii) Positive
(iii) Negative (iv) Either (i) or (iii)

3 In a transportation problem, items are allocated from sources to destinations
(i) At a maximum cost (ii) At a minimum cost
(iii) At a minimum profit (iv) At a minimum revenue

4 The method used for solving an assignment problem is called
(i) MODI method (ii) Reduced matrix method
(iii) Hungarian method (iv) Modified simplex method

5 The replacement policy that is imposed on an item irrespective of its failure is
(i) Group replacement (ii) Individual replacement
(iii) Repair spare replacement (iv) Successive replacement

6 Group replacement policy applies to
(i) Irreparable items (ii) Repairable items
(iii) Items that fail partially (iv) Items that fail completely & suddenly

7 Queuing theory is also termed as
(i) Game theory (ii) Replacement theory
(iii) Sequencing theory (iv) Waiting line theory

8 Traffic intensity in Queuing Theory is also called
(i) Service factor (ii) Arrival factor
(iii) Utilization factor (iv) None of these

9 _____ deals with making sound decisions under conditions of certainty, risk and uncertainty.
(i) Game theory (ii) Decision Theory
(iii) Network analysis (iv) Replacement theory

10 A type of decision – making environment is
(i) Certainty (ii) Uncertainty
(iii) Risk (iv) All of the above

Cont...

SECTION - B (35 Marks)

Answer **ALL** Questions

ALL Questions Carry **EQUAL** Marks (5 x 7 = 35)

11 a) Explain the Canonical and standard Form of LPP.

OR

b) Solve graphically:

Maximize $Z = X_1 + X_2$

Subject to the constraints $X_1 + 2X_2 \leq 2000$

$X_1 + X_2 \leq 1500$

$X_2 \leq 600$ and $X_1, X_2 \geq 0$

12 a) Obtain an initial basic feasible solution to the following transportation problem using North – West corner method.

	D	E	F	G	Available
A	6	4	1	5	14
B	8	9	2	7	16
C	4	3	6	2	5
Requirement	6	10	15	4	

OR

b) Describe the steps involved in solving of an unbalanced assignment problem.

13 a) Explain about the Elementary Replacement Model.

OR

b) A firm is considering replacement of a machine whose cost price is Rs. 17500 and the scrap value is Rs. 500. The maintenance costs (in Rs.) are found from experience to be as follows:

Year	1	2	3	4	5	6	7	8
Maintenance Cost (Rs.)	200	300	3500	1200	1800	2400	3300	4500

When should the machine be replaced?

14 a) A book binder has one printing press, one binding machine, and the manuscripts of a number of different books. The time required to perform the printing and binding operations for each book is shown below. Determine the order in which books should be processed, in order to minimize the total time required to turn out all the books:

Book	1	2	3	4	5	6
Printing Time (Hrs.)	30	120	50	20	90	100
Binding Time (Hrs.)	80	100	90	60	30	10

OR

b) Explain the Characteristics of Queuing Systems.

15 a) Discuss the various decision making environment.

OR

b) The pay-offs (in Rs.) of three acts A_1, A_2 and A_3 are the possible states of nature S_1, S_2 and S_3 are given below:

Acts	States of Nature		
	S1	S2	S3
A1	-200	2000	4000
A2	-500	-1000	6000
A3	2000	-500	3000

The probabilities of the state of nature are: 0.3, 0.4 and 0.3 respectively. Determine the optimal act using the EMV criterion.

SECTION - C (30 Marks)

Answer any **THREE** Questions
ALL Questions Carry **EQUAL** Marks (3 x 10 = 30)

16 Solve the LPP by using simplex method

Maximize $Z = 5X_1 + 3X_2$

Subject to the constraints $X_1 + X_2 \leq 2$

$5X_1 + 2X_2 \leq 10$

$3X_1 + 8X_2 \leq 12$ And $X_1, X_2 \geq 0$

17 Use Vogel's Approximation Method to obtain an initial basic feasible solution of the transportation problem.

	D	E	F	G	Available
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Demand	200	225	275	250	

18 A computer contains 10,000 resistors. When any resistor fails, it is replaced. The cost of replacing a resistor individually is Re. 1. If all the resistors are replaced at the same time, the cost per resistor would be reduced to 35 paise. The percent surviving say S(t) at the end of month t and P(t) the probability of failure during the month t, are:

t	0	1	2	3	4	5	6
S(t)	100	97	90	70	30	15	0
P(t)	-	0.03	0.07	0.20	0.40	0.15	0.15

What is the optimum replacement plan?

19 Determine the optimal sequence of jobs that minimizes the total elapsed time based on the following information processing time on machines is given in hours and passing is not allowed:

Job	A	B	C	D	E	F	G
Machine M_1	3	8	7	4	9	8	7
Machine M_2	4	3	2	5	1	4	3
Machine M_3	6	7	5	11	5	6	12

Cont...

20 The research department of Hindustan Unilever Ltd. has recommended to the marketing department to launch a shampoo of three different types. The marketing manager has to decide one of the types of shampoo to be launched under the following estimated pay-offs for various levels of sales:

Types of Shampoo	Estimated Levels of Sale(Units)		
	15000	10000	5000
Egg Shampoo	30	10	10
Clinic Shampoo	40	15	5
Deluxe Shampoo	55	20	3

What will be the marketing manager's decision if (i) Maximin (ii) Minimax (iii) Maximax (iv) Laplace and (v) Regret principle are applied?

Z-Z-Z END