PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

MCA DEGREE EXAMINATION MAY 2019
(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   For maximisation linear programming problem, the simplex method is terminated when all the net evaluations are
(i) negative   00   non-negative
(iii) zero   (iv) non-positive

2   A constraint in an LPP restricts
(i) value of objective function   (ii) value of a decision variable
(iii) use of available resource   (iv) uncertainty of optimum value

3   The transportation problem is balanced, if
(i)   total demand and total supply are equal and the number of sources equals the number of destinations
(ii)   total demand equals total supply irrespective of the number of sources and destinations
(iii) number of sources matches with the number of destinations
(iv) none of the routes is prohibited

4   The method used for solving an assignment problem is called
(i)   MODI method   (ii) reduced matrix method
(iii) Hungarian method   (iv) none of the above

5   The problem of replacement is not concerned about the
(i)   items that deteriorate graphically
(ii)   items that fail suddenly
(iii) determination of optimum replacement interval
(iv) maintenance of an item to work out profitability

6   Under group replacement policy
(i)   group as well as individual replacements are done
(ii)   all the items are replaced, irrespective of the fact that items have failed or have not failed
(iii) the optimal group replacement interval is determined at the point where the sum of group replacement per unit of time and the cost of individual replacement is maximum
(iv) all the above

7   In sequencing algorithm
(i) the selection of an appropriate order for a series of jobs is to be done on a finite service facilities
(ii)   all the jobs must be processed on a first - come - first service basis
(iii) a service facility can process more than one job at a time
(iv) all the service facilities are not of different type

8   When there are more than one servers, customer behaviour in which he moves from one queue to another is known as
(i)   balking   (ii) jockeying
(iii) reneging   (iv) alternating

9   The process of simulation
     (i)   is powerful mathematical technique
     (ii)   is often referred to as "Monte-Carlo" simulation
     (iii) usually require use of computers to solve the problems
     (iv)   involve the criterion wherein the output of a simulation model is
            independent of the simulation run

10   Which of the following is not used for decision-making under uncertainty?
     (i)   minimax criterion   (ii) maximax criterion
     (iii) minimize expected loss criterion   (iv) maximin criterion

SECTION - B (25 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** Marks (5 x 5 = 25)

11 a   Use graphical method to solve the LPP
       Maximise $Z=6x_1+4x_2$
       Subject to, $-2x_1+x_2<2$
       $3x_1+2x_2<9$ and $x_i, x_2 > 0$
                          OR
   b   Explain the characteristics of the Canonical form of an LPP.

12 a   Solve the initial basic feasible solution to the following transportation problem by
       North West Comer method.

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

                          OR
   b   Explain Vogel's Approximation method for solving transportation problem.

13 a   Explain individual and group replacement problem.
                          OR
   b   The cost of a machine is Rs.61,000 and its scrap value is Rs.1000 the maintenance
       cost found from the past experience are as follows:

Years	1	2	3	4	5	6	7	8
Maintenance Cost in rupees	1000	2500	4000	6000	9000	12000	16000	20000

       when should the machine be rep;aced.

14 a   In a factory, there are six jobs to perform each of which should go through two
       machines A and B in the order A,B. The processing time (in hours) for the jobs are
       given here. You are required to determine the sequence for performing the jobs
       that would minimize the total elapsed time, T. What is the value of T?

Job	J,	h	J₃	J₄	Js	h
Machine A	1	3	8	5	6	3
Machine B	5'	6	3	2	2	10

                          OR
   b   State the characteristics of queuing system.

15 a   The manager of a flower shop promises delivery within four hours on all flower
       orders. The flowers are purchased on the previous day and delivered to the
       manager buy 8.00 A.M. the next morning. Manager's daily demand for roses is as
       follows:
                                                                         Cont...

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15' a Cont...

Roses (in dozens)	7	8	9	10
Probability	0.1	0.2	0.4	0.3

The manager purchases roses for Rs.10 per dozen and sells them for Rs.30. All unsold are donated to a local hospital. How many dozens of roses should the manager order each evening to maximize its profits? What is the optimum expected profit?

OR

b Customers arrive at a milk booth for the required service. Assume that inter-arrival and service times are constant and given by 1.8 and 4 time units, respectively. Simulate the system by hand computations for 14 time units. What is the average waiting time per customer? What is the percentage idle time of the facility? [Assume that the system starts at t=0]

SECTION -C (40 Marks)
Answer ALL questions
ALL questions carry EQUAL Marks (5x8 = 40)

16 a Discuss the procedures for solving LPP using Simplex Methods.

OR

b Using Simplex method to solve the following LPP

Maximize $z = x_1 + 2x_2$

Subject to, $-x_1 + 2x_2 < 8$

$x_1 + 2x_2 < 12$

$x_1 - 2x_2 < 3$ and $x_1 > 0, X_2 > 0$

17 a Solve the initial solution to the following TP using Vogel's Approximation method.

		Destination				
		D1	D2	D3	D4	Supply
Factory	FI	3	3	4	1	100
	F2	4	2	4	2	125
	F3	1	5	3	2	75
	Demand	120	80	75	2	300

OR

b A marketing manager has 5 salesman and 5 districts. Considering the capabilities of the salesman and the nature of districts, the marketing manager estimates that sales per month (in 1000 rupees) for each sales man in each district would be follows:

Salesman	District				
	A	. B	C	D	E
1	32	38	40	28	40
2	40	24	28	21	36
3	41	27	33	30	37
4	22	38	41	36	36
5	29	33	40	35	39

Solve the assignment of salesman to district that will result in maximum sales.

18 a A machine cost Rs. 15,000. T re running costs for the different years are gb

! Years	1	2	3 I 4	5	6	7
| Running	2500	3000	4000 1 5000	6500	8000	10000

and has no salvage value.

OR

18 Cont...

b A manufacturer is offered two machines A and B. A is priced Rs.5000 and running costs are estimated at Rs.800 for each of the first five years, increasing by Rs.200 per year in the sixth and subsequent years. Machine B, which has the same capacity as A, costs Rs.2500 but will have running costs of Rs. 1200 per year for six years increasing by Rs.200 per year thereafter

If money is worth 10% per year, which machine should be purchased?
(Assume that the machines will eventually be sold for scrap at a negligible price).

19 a In a public telephone booth, the arrivals on an average are 15 per hours 4 call on an average takes three minutes. It there is just one phone. Find
(i) the expected number of callers in the booth at any time
(ii) the proportion of the time the booth is expected to be idle?

OR

b 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 a lowed:

Job	A	B	C	D	E	F	G
Machine Ml	3	8	7	4	9	8	7
Machine M2	4	3	2	5	1	4	3
Machine M3	6	7	5	11	5	6	12

20 a Your company manufactures goods for a market in which the technology of the products change rapidly. The research and development department produced a new product which appears to have potential for commercial exploitation. A further Rs.60,000 is required for development testing.

As a result of previous experience of this type of market, it has been possible to derive a probability distribution relating to the proportion of customers who buy the product as follows.

Proportion of customers	Probability
0.04	0.1
0.08	0.1
0.12	0.2
0.16	0.4
0.20	0.2

Determine the expected opportunity losses, given no other information then that stated above, and state whether or not the company should develop the product.

OR

b The occurrence of rain in a city on a day is independent upon whether or not it rained on the previous day. If it rained on the previous day, the rain distribution is

Event	No rain	1 cm.rain	2 cm.rain	3 cm.rain	4 cm.rain	5 cm.rain
Probability	0.50	0.25	0.15	0.05	0.03	0.02

f it did not rain on the previous day, the rain distribution is:

Event	No rain	1 cm.rain	2 cm.rain	3 cm.rain
Probability	0.75	0.15	0.06	0.04

Simulate the city's whether for 10 days and determine by simulation the total days without rain as well as the total rainfall during the period. Use the following random numbers for simulation:

67	63	39	55	29	7	70	06	78	76

Assume that for the first day of the simulation it had not rained the day before.

z-z-z   END