Avinashilingam Institute for Home Science and Higher Education for Women
(Deemed to be University) Coimbatore – 43

Master's Degree Examination November 2018
III Semester

Class: II PG **Time: 3 hrs**
Major: Business Administration **Max. Marks: 60**

17MBAC19 – APPLIED OPERATIONS RESEARCH

PART – A **10 X ½ = 5**

Choose the Correct answer

1. A constraint in an LP model restricts
   a. Value of objective function b.Value of a decision variable
   c. Use of the available resources d.All of the above

2. A feasible solution to an LP problem
   a. Must satisfy all of the problem's constraints simultaneously
   b. Need not satisfy all of the constraints, only some of them
   c. Must be a corner point of the feasible region
   d. Must optimize the value of the objective function

3. The solution to a transportation problem with 'm' rows (supplies) & 'n' columns (destination) is feasible if number of positive allocations are
   a. m+n b.m*n c.m+n-1 d.m+n+1

4. When total supply is equal to total demand in a transportation problem, the problem is said to be
   a. Balanced b.Unbalanced c.Degenerate d.None of the above

5. Which of the following statements regarding CPM networks is true?
   a. The early finish of an activity is the latest early start of all preceding activities.
   b. The late finish of an activity is the earliest late start of all preceding activities.
   c. On a specific project, there can be multiple critical paths, all of which will have exactly the same duration.
   d. A project does not have to have a critical path.

6. Decision variables are
   a. Controllable b.Uncontrollable c.Parameters d.None of the above

7. Times between two successive requests arriving, called the
   a. Inter arrival time b.Arrival time c.Poisson distribution d.Average residual service time

8. Which of the following is not a key operating characteristics apply to queuing system
   a. Utilization factor
   b. Percent idle time
   c. Average time spent waiting in the system & queue
   d. None of the above

9. An advantage of simulation as opposed to optimization is that
   a. Several options of measure of performance can be examined
   b. Complex real-life problems can be studied
   c. It is applicable in cases where there is an element of randomness in a system
   d. All of the above

10. In dynamic programming, the technique of storing the previously calculated values is called _____

a. Saving value property b. Storing value property
c. Memoization d. Mapping

PART – B **5 X 4 = 20 Marks**

Answer all the questions

Answer should not exceed 200 words or one page

11. a) Write a brief note on unbounded solutions of an LPP

(Or)

b) Brief various applications of Linear Programming for solving business problems.

12.a) Bring out the difference between assignment problem and transportation problem.

(Or)

b) Give a brief note on Prohibited Assignment and bring out the steps to convert it into normal assignment problem.

13.a. Develop a network diagram for the project specified below

Activity	A	B	C,D	E	F	G
Immediate Predecessor Activity	-	A	B	C	D	E,F

(Or)

b. Bring out the difference between PERT and CPM

14.a. Brief the concept of group replacement theory?

(Or)

b. List out the basic characteristics of a queuing system.

15.a. Bring out the difference between simulation and optimization

(Or)

b. What is dynamic programming management decision making? Brief its advantages.

PART –C **5 X 7= 35 Marks**

Answer all the questions

Answer should not exceed 600 words or 3 pages

Q. No 20 is Compulsory

16.a) Solve the LPP using dual simplex method

Min z = 2x1 + x2

s.t. 3x1 + x2 ≥ 3
4x1 + 3x2 ≥ 6
x1 + 2x2 ≤ 3
xi ≥ 0

(Or)

b. Maximise$Z = 0.75\,a + 1b$
Subject to
$1a + 1b \geq 0$
$-0.5\,a + 1b \leq 1$ and both a and$b$ are ≥ 0.

Solve this using Graphical Method.

17.a) Four factories, *A*, *B*, *C* and *D* produce sugar and the capacity of each factory is given below: Factory *A* produces 10 tons of sugar and *B* produces 8 tons of sugar, *C* produces 5 tons of sugar and that of *D* is 6 tons of sugar. The sugar has demand in three markets *X*, *Y* and *Z*. The demand of market *X* is 7 tons, that of market *Y* is 12 tons and the demand of market *Z* is 4 tons. The following matrix gives the transportation cost of 1 ton of sugar from each factory to the destinations. Find the Optimal Solution for least cost transportation cost by Vogel's approximation method.

(Or)

b) Four captain pilots (CP1, CP2, CP3, CP4) has evaluated four flight officers (FO1, FO2, FO3, FO4) according to perfection, adaptation, morale motivation in a 1-20 scale (1: very good, 20: very bad). Evaluation grades are given in the table. Flight Company wants to assign each flight officer to a captain pilot according to these evaluations. Determine possible flight crews.

	FO1	FO2	FO3	FO4
CP1	2	4	6	10
CP2	2	12	6	5
CP3	7	8	3	9
CP4	14	5	8	7

18.a) A small project is composed of 7 activities whose time estimates are listed below.

Activities are being identified by their beginning (i) and ending (j) node umbers

Activities		Time in weeks		
i	J	t_o	t_l	t_p
1	2	1	1	7
1	3	1	4	7
1	4	2	2	8
2	5	1	1	1
3	5	2	5	14
4	6	2	5	8
5	6	3	6	15

1. Draw the network.
2. Calculate the expected variances for each.
3. Find the expected project completed time.
4. Calculate the probability that the project will be completed at least 3 weeks than expected.
5. If the project due date is 18 weeks, what is the probability.

(Or)

b) Machine A cost Rs. 45000 and the operating costs are estimated at Rs. 1000 for the first year increasing by Rs. 10000 per year in the second and subsequent years. Machine B cost Rs. 50000 and operating cost are Rs 2000 for the first year, increasing by Rs. 4000 in the second and subsequent years. If we now have a machine of type A, should we replace it with B? If so when? Assume that both machines have no resale value and future costs are not discounted.

19.a) A fertilizer company distributes its products by trucks loaded at its only loading station. Both company trucks and contractor's trucks are used for this purpose. If was found that on an average every 5 minutes one truck arrived and the average loading time was 3 minutes. 40% of the trucks belong to the contractors. Making suitable assumptions determine.

(1)The probability that a truck has to wait.

(2)The waiting time of a truck that waits.

(3)The expected waiting time of contractor's trucks per day

(Or)

b) Explain the benefits of Operation Research in the field of Information Technology

Compulsory:

20)A company manufactures three products namely *X*, *Y* and *Z*. Each of the product require processing on three machines, Turning, Milling and Grinding. Product *X* requires 10 hours of turning, 5 hours of milling and 1 hour of grinding. Product *Y* requires 5 hours of turning, 10 hours of milling and 1 hour of grinding, and Product Z requires 2 hours of turning, 4 hours of milling and 2 hours of grinding. In the coming planning period, 2700 hours of turning, 2200 hours of milling and 500 hours of grinding are available. The profit contribution of *X*, *Y* and Z are Rs. 10, Rs.15 and Rs. 20 per unit respectively. Find the optimal product mix to maximize the profit.