The Assam Royal Global University, Guwahati
Royal School of Business
BBA+MBA Integrated 7th Semester / MBA 3rd Semester
Special Supplementary Examination, August 2024
Course Title: Decision Making and Optimization
Course Code: BSA034C302

Time: 3 Hours **Maximum Marks: 70**

Note: Attempt all questions as per instructions given.
The figures in the right-hand margin indicate marks.

Section – A

1. Attempt **all questions**. (Maximum word limit 50) **2 x 8**

   a. Define OR and state one important application of OR in business.
   b. State the assumptions of LPP.
   c. Define degeneracy.
   d. State the condition of Johnson's rule for sequencing n jobs through 2 machines.
   e. Define saddle point.
   f. List two applications of Monte Carlo simulation.
   g. Identify two situations that generate queuing problems.
   h. What are the different types of failure?

Section – B

2. Attempt **any one** of the following: **12 x 1**

   a. The ABC Company has been a producer of picture tubes for television sets and certain printed circuits for radios. The company has just expanded into full scale production and marketing of AM and AM-FM radios. It has built a new plant that can operate 48 hours per week. Production of an AM radio in the new plant will require 2 hours and production of an AM-FM radio will require 3 hours. Each AM radio will contribute Rs 40 to profits while an AM-FM radio will contribute Rs 80 to profits. The marketing department, after extensive research has determined that a maximum of 15 AM radios and 10 AM-FM radios can be sold each week.

      i. Formulate a linear programming model to determine the optimum production mix of AM and FM radios that will maximize profits.
      ii. Solve this problem using the graphical method.

   b. Discuss the business problems that can be analyzed by the Operations Research approach.

3. Attempt **any two** of the following: 7 x 2

a. Given the following transportation problem:

Warehouse	Market			Supply
	A	B	C	
1	10	12	7	180
2	14	11	6	100
3	9	5	13	160
4	11	7	9	120
Demand	240	200	220	

It is known that currently nothing can be sent from warehouse 1 to market A and from warehouse 3 to market C. Solve the problem and determine the least cost transportation schedule. Is the optimal solution obtained by you unique? If not, what is/are the other optimal solution/s?

b. A firm works 40 hours a week and has a capacity of overtime work to the extent of 20 hours in a week. It has received seven orders to be processed on three machines A, B and C in the order A, B, C to be delivered in a week's time from now. The process times (in hours) are recorder in the given table:

Job	:	1	2	3	4	5	6	7
Machine A	:	7	8	6	6	7	8	5
Machine B	:	2	2	1	3	3	2	4
Machine C	:	6	5	4	4	2	1	5

The manager, who, in fairness, insists on performing the jobs in the sequence in which they are received, is refusing to accept an eight order, which requires 7, 2 and 5 hours respectively on A, B and C machines, because, according to him, the eight jobs would require a total of 61 hours for processing, which exceeds the firm's capacity. Advise him.

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c. A salesman must travel from city to city to maintain his accounts. This week he has to leave his home base and visit four other cities and return home. The table shows the distances (in km) between the various cities. The home city is city A. Use the assignment method to determine the tour that will minimize the total distances of visiting all cities and returning home.

From City	To City				
	A	B	C	D	E
A	–	375	600	150	190
B	375	–	300	350	175
C	600	300	–	350	500
D	160	350	350	–	300
E	190	175	500	300	–

4. Attempt **any two** of the following: **7 x 2**

a. What is game theory? State the assumptions underlying it. Discuss its importance to business decisions.

b. In a small town, there are only two stores that handle sundry goods – *ABC* and *XYZ*. The total number of customers is equally divided between the two, because price and quality of goods are equal. Both stores have good reputation in the community, and they render equally good customer service. Assume that a gain of customer by *ABC* is a loss to *XYZ* and vice-versa. Both stores plan to run annual pre-Diwali sales during the first week of November. Sales are advertised through a local newspaper, radio and television media. With the aid of an advertising firm, store *ABC* constructed the game matrix given below.

(Figures in the matrix represent a gain or loss of customers)

Strategy of ABC	Strategy of XYZ		
	Newspaper	Radio	Television
Newspaper	30	40	– 80
Radio	0	15	– 20
Television	90	20	50

Determine optimal strategies and worth of such strategies for both *ABC* and *XYZ*.

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c. A company manufactures around 150 mopeds. The daily production varies from 146 to 154 depending upon the availability of raw materials and other working conditions.

Production per day	146	147	148	149	150	151	152	153	154
Probability	0.04	0.09	0.12	0.14	0.11	0.10	0.20	0.12	0.08

The finished mopeds are transported in a specially arranged lorry accommodating only 150 mopeds. Using following random numbers 80, 81, 76, 75, 64, 43, 18, 26, 10, 12, 65, 68, 69, 61, 57, simulate the process to find out:

    i. What will be the average number of mopeds waiting in the factory?
    ii. What will be the average number of empty spaces on the lorry?

5. Attempt **any two** of the following: 7 x 2

a. Give a general structure of the queuing system and explain. Illustrate some queuing situations.

b. Arrivals at a telephone booth are considered to be Poisson, with an average time of 10 minutes between one arrival and the next. The length of a phone call is assumed to be distributed exponentially, with mean 3 minutes. Find:

    i. The probability that an arrival finds that four persons are waiting for their turn;
    ii. The average number of persons waiting and making telephone calls; and
    iii. The average length of the queue that is formed from time to time.

c. What is replacement? Describe some important replacement situations.