Karunya University
(Karunya Institute of Technology and Sciences)
(Declared as Deemed to be University under Sec.3 of the UGC Act, 1965)

End Semester Examinations - 2015-16 MBA Trimester - May 2016

14MS3014 Applied Operations Research

Set B

Time : 3 hrs
Total Marks: 100

1. (a) Explain the essential features of Operations Research Approach.

   (b) How does Operations Research assist Management in Decision Making.

OR

2. A retired person wants to invest up to an amount of Rs. 30,000 in the fixed income securities. His broker recommends investing in two bonds. Bond A yielding 7% per annum and Bond B yielding 10% per annum. After some consideration, he decides to invest at the most Rs. 12,000 in Bond B and at least Rs. 6,000 in Bond A. He also wants that the amount invested in Bond A must be at least equal to the amount invested in Bond B. What should the broker recommend if the investor wants to maximize his return on investment? Solve Graphically.

3. A dairy farm has three plants located in a State. The daily milk production at each plant is as follows:

   Plant 1: 6 million litres; Plant 2: 1 million litres; and Plant 3: 10 million litres.

   Each day the firm must fulfill the needs of its four distribution centres. Minimum requirement at each centre is as follows:

   Distribution Centre 1: 7 million litres; Distribution Centre 2: 5 million litres; Distribution Centre 3: 3 million litres; and Distribution Centre 4: 2 million litres.

   Cost in hundreds of rupees of shipping one million litre from each plant to each distribution centre is given in the following table: Find the initial feasible solution by (i) NWC, (ii) LCM and (iii) VAM and compare the solutions.

	D1	D2	D3	D4
Plant 1	2	3	11	7
Plant 2	1	0	6	1
Plant 3	5	8	15	9

OR

4. A department has five employees with five jobs to be performed. The time (in hours) each men will take to perform each job is given in the effectiveness matrix. How should the jobs be allocated one per employee, so as to minimize the total man-hours?

Job/Employees	**1**	**2**	**3**	**4**	**5**
A	10	5	13	15	16
B	3	9	18	13	6
C	10	7	2	2	2
D	7	11	9	7	12
E	7	9	10	4	12

5. Find the sequence that minimizes the total Elapsed time required to complete the following tasks on two machines.

Task	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**
Machine 1	2	5	4	9	6	8	7	5	4
Machine 2	6	8	7	4	3	9	3	8	11

OR

6. (i)Define the following terminologies : (a) No. of Machines, (b) Processing Time, (c) Idle Time of a Machine, (d) Total Lapsed Time (10 Marks)

(ii) steps to solve the Processing n jobs through two machines. (10 Marks)

7. Find the sequence that minimize the total elapsed time required to complete the following tasks on two machines

Task	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Machine A	4	10	8	18	12	16	14	10	8
Machine B	12	16	14	8	6	18	6	16	22

OR

8. An insurance company has decided to modernize and refit one of its branch offices. Some of the existing office equipments will be disposed of but the remaining will be returned to the branch of completion of the renovation work. Tenders are invited from a number of selected contractors. The contractors will be responsible for all the activities in connection with the renovation work expecting the prior removal of the old equipment and its subsequent replacement. The major elements of the Projects have been identified as follows along with their durations and immediately preceding elements.

Activity	**Duration (Weeks)**	**Immediate Predecessors**
A	14	-
B	4	A
C	2	B
D	1	C
E	2	A
F	3	E
G	2	E
H	4	E
I	3	H,L
J	12	K
K	4	D,F,G
L	2	J
M	2	H,L

(a) Draw the Network Diagram showing the inter-relations between the various activities of the Project. (15 Marks)

(b) Calculate the Critical Path of the Project and Total Project Completion Time (5 Marks)

9. By means of sharp bargaining with the Union and Subsequent reduction of Union "Make Work" restrictions in his former contract, a small paper towel manufacturer has created some spare capacity in each of his three main Production Departments; Cutting, Folding and Packaging. For the purpose of identification, three different sizes of Paper Towel are called products A, B and C. Owing to its small size, the company can sell in the market, all that it can produce at a constant prize. Management is inclined to be conservative and does not wish to expand production facilities at this time, although they do wish to utilse fully the present spare capacity. The Paper Towelling received from another Manufacturer in large rolls. These rolls are subsequently cut, folded and packed in three sizes. The pertinent manufacturing and profit information for each size of Paper Towel is summarized as below:

Department	**Size**			**Constraints for Time Period per week**
	A	**B**	**C**	
Cutting	10.7	5.0	2.0	2705
Folding	5.4	10.0	4.0	2210
Packaging	0.7	1.0	2.0	445
Profit Contribution per unit (In Rs.)	10.0	15.0	20.0	

Solve using Simplex Method and find out the Optimal Profit.

Wishing you All the Best