Your Roll No. ....

MBA (FT)   A

Paper F – 202 – MANAGEMENT SCIENCE

(Admisisons of 1998 and onwards)

Time : 3 hours   *Maximum Marks : 70*

(Write your Roll No. on the top immediately on receipt of this question paper.)

Answer any **five** *questions.* **All** *questions carry equal marks.*

1. A manufacturer of jeans is interested in developing an advertising campaign that will reach four different age groups. Advertising campaigns can be conducted through TV, Radio and Magazines. The following table gives the estimated cost in Rs. per exposure for each age group according to the medium employed. In addition, maximum exposure levels possible in each of the media namely TV, Radio and Magazines are 40, 30 and 20 millions respectively. Also the minimum desired exposures within age group namely 13-18, 19-25, 26-35, 36 and older are 30, 25, 15 and 10 millions. The objective is to minimize the cost of attaining the minimum exposure level in each group.

Media	Age Groups			
	13-18	**19-25**	**26-35**	**36 & older**
TV	12	7	10	10
Radio	10	9	12	10
Magazines	14	12	9	12

Formulate the above as a transportation problem and find the optimal solution.

(14)

2. (a) The captain of a cricket team has to allot five middle batting positions to five batsmen. The average runs scored by each batsman at these positions are as follows:

Batting positions

Batsman	I	II	III	IV	V
P	40	40	35	25	50
Q	42	30	16	25	27
R	50	48	40	60	50
S	20	19	20	18	25
T	58	60	59	55	53

Find the assignment of batsmen to positions, which would give the maximum number of runs.

(b) A salesman travels from one place to another. He cannot, however, travel from one place and back. The distances (in kms) between pairs of cities are given below: P.T.O.

		To city		
		P	Q	R	S
From city	P	-	15	25	20
	Q	22	-	45	55
	R	40	30	-	25
	S	20	26	38	-

The problem is to chalk out a route which enables him to visit each of these cities only once, so that the total travel distance covered by him is minimum.

$(7+7) = 14$

3. In the metropolitan city of Bangalore, the Bangalore Development Authority is undertaking several construction projects. Many of these projects involve construction of huge flyovers and the organizations involved in the work do not have adequate prior experience of constructing similar flyovers. Moreover, the process is riddled with considerable uncertainty due to political and public interference. Consequently although estimation of activities is possible, estimation of the duration of the project is difficult. The following table gives the list of the activities and three possible time estimates for the same. Use this information to analyze the problem of uncertainty by answering the questions given at the end of the table.

Activity	Predecessor(s)	Optimistic (months)	Most likely (months)	Pessimistic (months)
A	-	2	4	9
B	-	2	3	8
C	B	4	7	14
D	A	4	5	16
E	B	5	7	12
F	C,D	2	4	8
G	C,D	6	8	14
H	E,F	6	7	14
I	G,H	2	3	9

(i)   Draw the network diagram of the project and identify alternative paths in the network.

(ii)   For each path compute the expected duration and hence identify the critical path and the near critical path of the problem.

(iii) What is the probability of completion of the project by 36 months?

(iv) . If the organization wants to ensure 80 % probability of completion, what date should it set for project completion?

(v.) Compute the probability of completion of the project for the near critical path. Do you observe anything interesting in your results? Comment on the analysis.

(14)

4. A manufacturing organization has received a turnkey project for manufacture of custom-made equipment for one of its clients. The project involves several activities and the following table has the details on the activities, duration and normal and crash costs for the activities. Since it is a turnkey project, the organization incurs a cost of Rs. 6000 per week towards special supervision of the project. The cost is incurred for the length of the project duration. The project manager would like to know if there is some merit in crashing the project duration. Evaluate the cost-time trade-offs involved in the project and suitably advise the project manager.

Activity	Predecessor(s)	Normal Duration	Crash duration	Normal cost(Rs)	Crash cost(Rs)
A	-	6	5	10,000	15,000
B	-	4	3	12,000	14,000
C	A	5	NA	16,000	NA
D	B	3	NA	18,000	NA
E	C	4	2	11,000	17,000
F	D	4	2	24,000	32,000
G	C	4	3	12,000	18,000
H	D	9	6	50,000	68,000
I	E,F	2	NA	16,000	NA
J	G,H,I	3	2	10,000	11,000

(14)

5. (a) Explain the difference between expected monetary value, expected opportunity loss and expected value of perfect information.

(b) The ore mining company is attempting to decide whether or not a certain piece of land should be purchased. The land cost is Rs. 300,000. If there are commercial ore deposits on the land, the estimated value of property is Rs. 500,000. If no ore deposits exists, however, the property value is estimated at Rs. 200,000. Before purchasing the land, the property can be cored at Rs. 20,000. The coring will indicate if conditions are favourable or unfavourable for ore mining. If the coring report is favourable, the probability of recoverable ore deposits

on the land is 0.8, while if the coring report is unfavourable, the probability is only 0.2. Prior to obtaining any coring information, management estimates that the odds are 50:50 that ore is present on the land. Management has also received coring report on pieces of land similar to the ore in question and found that 60% of the coring reports were favourable.

Construct a decision tree and determine whether the company should purchase the land, decline to purchase it or take a coring test before making its decision. Specify the optimal course of action and EMV. (4+10) = 14

6. (a) A market survey is made on three brands of breakfast foods X, Y and Z. Every time the customer purchases a new package, he may buy the same brand or switch to another brand. The following estimates are obtained, expressed as decimal fractions:

		Brands just purchased		
		X	Y	Z
Present brand	X	0.7	0.2	0.1
	Y	0.3	0.5	0.2
	Z	0.3	0.3	0.4

At this time, it is estimated that 30% of the people buy brand X, 20% brand Y and 50% brand Z. What will the distribution of customers be, two periods later, and at equilibrium?

(b) Compare among ABC, VED and FSN analysis of selective inventory control.

(8+6) = 14

7. (a) Two companies A and B are competing for their competitive product. To improve its market share, company A decides to launch the following strategies:

A1: Home delivery services

A2: Mail order services

A3: Free gift for customer

As a countermove, the company B decides to use media advertising to promote its product:

· B1: Radio

B2: Magazine

B3: Newspaper

Past experience and recent studies reveal that the payoff matrix to company A for any combination of strategies is

		Company B		
		B1	B2	B3
Company A	A1	-2	12	-4
	A2	1	4	8
	A3	-5	2	3

What is the optimal strategy for both the companies and the value of the game?

(b) Modern Fashions Ltd. is a producer of garments for children. The company specializes in producing two basic styles: regular and premium. The production of all garments is done in a modern sewing centre. A regular garment requires an average of 5 minutes in the sewing centre while the premium one requires an average of 8 minutes. The normal operation time available in the sewing centre is, for two shifts, 80 hours per week. The unit profit for each type of garment is: regular - $2.50, premium - $3.00. The President of the company has set the following goals listed in order of their importance: ·

i. Achieve the profit goal of $2000 per week.

ii. Limit the overtime operation of the sewing centre to a maximum of 8 hours per week.

iii. Meet the sales goal of 400 premium garments per week.

iv. Meet the sales goal of 500 regular garments per week.

Formulate the above problem as a goal programming problem.   (8+6) = 14

8. (a) Why do waiting lines form even though a service system is underloaded? In a multiple-channel system, what is the rationale for having customers wait in a single line, as is now being done in many banks and post offices, rather than multiple lines?

(b) Trucks are required to pass through a weighing station so that they can be checked for weight violations. Trucks arrive at the station at the rate of 40 an hour between 7 pm and 9 pm. Currently two inspectors are on duty during those hours, each of whom can inspect 25 trucks an hour.

   i.   How many trucks would you expect to see at the weighing station including those being inspected?

   ii.   If a truck was just arriving at the station, about how many minutes could the driver expect to be at the station?

   iii.   What is the probability that both inspectors would be busy at the same time?

   iv.   How many minutes, on an average, would a truck that is not immediately inspected have to wait?

   v.   'What condition would exist if there was only one inspector?

                                        (4+10) = 14