FACULTY OF MANAGEMENT STUDIES
UNIVERSITY OF DELHI
MBA Iyr 2nd Semester Examination, March-April 2015
MBAFT 6202: Management Science

Time: 3 hours **Maximum marks:** 50

Answer any **FIVE** questions [10 x 5 marks]

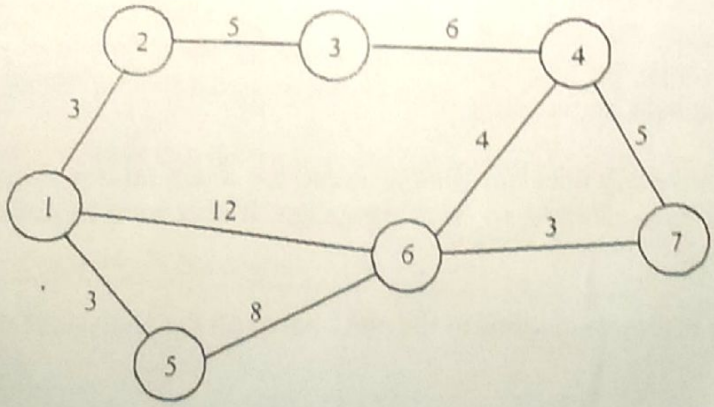
1.(a) Apples are to be transported from three orchards to two canneries. Intermediate stops at a consolidation station are possible.

Orchard	Supply	Station	Cannery	Capacity
Riverside	1200	Wazirabad	Sasvad	2500
SurajPur	1500	Nainital	Mandi	3000
Old Farm	2000			

Shipment costs are shown in the table below. Where no cost is given, shipments are not possible. Where costs are shown, shipments are possible in either direction. Draw the network model for this problem.

	R	SP	OF	W	N	S	M
Riverside		1		5		3	
SurajPur				4	5		
Old Farm				6	3		
Wazirabad					2	2	4
Nainital						5	9
Sasvad							2
Mandi							

(b) A fruit juice distributor needs to plan how to make deliveries from its warehouse (Node 1) to a supermarket (Node 7), as shown in the network below. Develop the LP formulation for finding the shortest route from the warehouse to the supermarket.



2. Super Cola is also considering the introduction of a root beer drink. The company feels that the probability that the product will be a success is 0.6. The payoff table is as follows:

	Success (s_1)	Failure (s_2)
Produce (d_1)	Rs.250million	(−)Rs.300 million
Do Not Produce (d_2)	(−)Rs.50 million	(−)Rs.20 million

The company has a choice of two research firms to obtain information for this product.

Stanton Marketing has market indicators, I_1 and I_2 for which.
$P(I_1 \mid s_1) = 0.7$ and $P(I_1 \mid s_2) = 0.4$.

New World Marketing has indicators J_1 and J_2 for which
$P(J_1 \mid s_1) = 0.6$ and $P(J_1 \mid s_2) = 0.3$.

i. Find the EVSIs and efficiencies for Stanton and New World.

ii. If both firms charge Rs.5 million, which firm should be hired?

3. A political party has fielded a candidate for the upcoming assembly bye-election. The breakdown of the steps to the nomination and estimated normal and crash costs and times for the campaign are as follows (times are in weeks).

	Activity	Normal Time	Normal Cost (Rs. L)	Crash Time	Crash Cost (Rs. L)	Immediate Predecessors
A.	Solicit Volunteers	6	5	4	9	---
B.	Initial "Free" Exposure	3	4	3	4	---
C.	Raise Money	9	4	6	10	A
D.	Organize Schedule	4	1	2	2	A
E.	Hire Advertising Firm	2	1.5	1	2	B
F.	Arrange TV Interview	3	4	1	8	B
G.	Advertising Campaign	5	7	4	12	C,E
H.	Personal Campaigning	7	8	5	20	D,F

The political party does not want to spend too much on this minor election and if possible would like to organize a 16-week campaign. It also want to run the campaign at minimum cost possible.

Give your recommendations to the party based on the analysis if the above data.

4.(a) Demand for a popular athletic shoe is nearly constant at 80 pairs per week for a regional division of a national retailer. The cost per pair is Rs.540, which sell for Rs.900. It costs Rs.1000 to place an order, and annual holding costs are charged at 20% of the cost per unit. The lead time is two weeks.

i. What is the EOQ?

ii. What is the reorder point?

iii. What is the cycle time?

iv. What is the total annual cost?

(b) A professor has been contacted by four not-for-profit agencies that are willing to work with student consulting teams. The agencies need help with such things as budgeting, information systems and coordinating volunteers. Although each of the four student teams could work with any of the agencies, the professor feels that there is a difference in the amount of time it would take each group to solve each problem. The professor's estimate of the time, in days, is given in the table below.

Develop (do not solve) an optimization model (ILP) to see which team works with which project.

	Projects		
Team	Budgeting	Information	Volunteers
A	32	35	15
B	38	40	18
C	41	42	25
D	45	45	30

5.(a) Two firms (X and Y) compete with each other in the market for a luxury product. For the upcoming season, both are finalizing their marketing strategies. The expected behavior of the market can be modelled as the following two-person, zero-sum game. Payoffs are the winnings for Company X. Does the game has a saddle point?

Formulate the linear program that determines the optimal strategy for Company X.

	Company Y Strategies		
Company X Strategies	y_1	y_2	y_3
x_1	5	4	10
x_2	3	6	2
x_3	7	2	8

(b) An ATM is to be located in a campusbuilding so that it minimizes the distance from the food court, the gift shop, and the theater. They are located at coordinates (2,2), (0,6) and (8,0).

Develop a goal programming model to use to locate the best place for the ATM.

6.(a) The Delhi Superdevil hockey team has one box office clerk. On average, each spectator that comes to see a game can be sold a ticket at the rate of 8 per minute. For normal games, spectators arrive at the rate of 5 per minute. Assume arrivals follow the Poisson distribution and service times follow the exponential distribution.

i. What is the average number of customers waiting in line?

ii. What is the average time a customer spends in the waiting line?

iii. What is the average number of customers in the system?

iv. What is a customer's average time in the system?

v. What is the probability that someone will be buying tickets when an arrival occurs?

(b) The daily price of a farm commodity is up, down, or unchanged from the day before. Analysts predict that if the last price was down, there is a .5 probability the next will be down, and a .4 probability the price will be unchanged. If the last price was unchanged, there is a .35 probability it will be down and a .35 probability it will be up. For prices whose last movement was up, the probabilities of down, unchanged, and up are .1, .3, and .6.

i. Construct the matrix of transition probabilities.

ii. Calculate the steady state probabilities.