Seat No. : _______________

NB-140

December-2015

4th Year MBA Integrated

Quantitative Techniques for Management – I

Time : 3 Hours] **[Max. Marks : 100**

Instructions : (1) Log tables and statistical tables shall be provided on demand.
(2) Non-programmable scientific calculators are allowed.
(3) Answer the questions neatly in sequence.

1. Attempt any **four** : **20**

(i) With what half yearly payment, one can clear a debt of ₹ 1,25,400 due after two years at 6% per annum simple interest.

(ii) Let the cost of asset be ₹ 20,000 with the scrap value of ₹ 2,000 at the end of eight years of useful economic life. Construct the depreciation schedule using the sinking fund method if the interest rate is 5%.

(iii) A machine costs ₹ 80,000. The use of the machine will result in savings of ₹ 10,000 for 10 years. After 10 years, the salvage value will be ₹ 12,000. Interest rate is 8% per annum. Purchase price is paid in full immediately and savings are all obtained at the end of each year. Should the machine be purchased ?

(iv) A debt of ₹ 20,000 due in 3 years and ₹ 3,00,000 due in 7 years is to be repaid by a single payment of ₹ 1,00,000 now and two equal payments which are due 1 year from now and 4 years from now. If the interest rate is 7% compounded annually, how much are each of the equal payments ?

(v) Define :
  (i) Force of interest
  (ii) Leasing

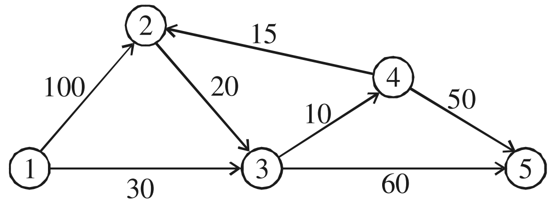
2. Attempt any **two** : **20**

(a) A and B play a game in which each has three coins a 5p, 10p and 20p. Each player selects a coin without the knowledge of the other's choice. If the sum of the coins is an odd amount, A wins B's coin; if the sum is even, B wins A's coin. **10**

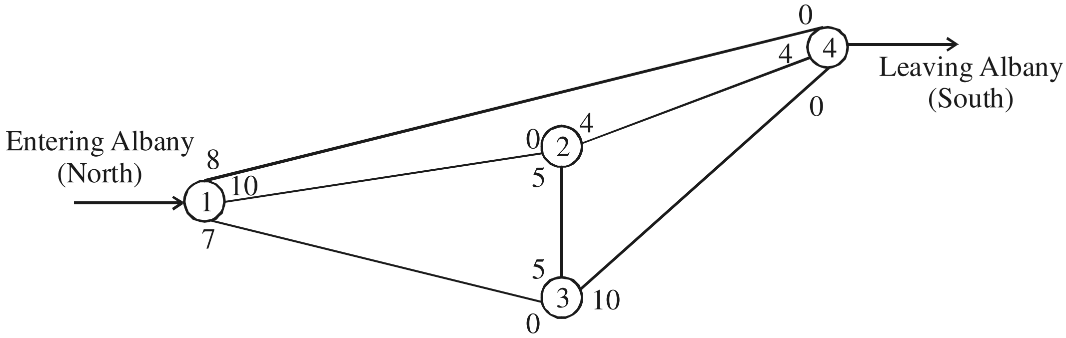
		Player B		
		(5)	(10)	(20)
	(5)	–5	10	20
Player A	(10)	5	–10	–10
	(20)	5	–20	–20

Find the best strategy for each player and the value of the game.

(b) The network in the following figure gives the permissible routes and their lengths in miles between city 1 and four other cities. Determine the shortest routes between city 1 and each of the remaining four cities. **10**



(c) The north-south highway system passing through Albany, New York, can accommodate the capacities shown in the figure. **10**



What is the maximal flow of vehicles per hour through the system ?

3. Attempt any **two** : **20**

(a) (i) A company manufacturing chemicals has 4 independent investment projects and must allocate a fixed capital budget to one or more of them so that the company's total assets are maximized. The estimated investments and the anticipated cash outflows associated with these projects are given in the table below : **5**

Project	**Investment (₹ lakhs)**		**Cash inflows (₹ lakhs)**
	1st Year	**2nd Year**	
A	60	160	105
B	108	140	140
C	200	150	80
D	90	70	100

The company has earmarked ₹ 600 lakhs for investment in the first year and ₹ 700 lakhs in the second year. If projects A and C are mutually exclusive, how should the investment be made so that the company's total assets are maximized ?

(ii) A small furnishing company manufactures tables and chairs. Each chair requires 4 man – hours of labour while each table requires 5 man – hours of labour. Only 40 man – hours are available each week and the owner of the company would neither hire additional labour nor utilize overtime. Both the table and the chair fetch a profit of ₹ 100 each. The owner has a target to earn a profit of ₹ 2,000 per week. Also he would like to supply 10 chairs, if possible, per week to a sister concern. **5**

The goals of the company and their assigned priorities are

Priority	**Goal**
1st	To avoid hiring extra labour or utilize overtime
2nd	To reach a profit goal of ₹ 2,000 a week
3rd	To supply 10 chairs a week to the sister concern

Formulate the linear goal programming problem.

(b) Find the optimum all integer solution to the following integer programming problem **10**

Max $z = x_1 + 2x_2$

Subject to constraints

$$2x_2 \leq 7$$
$$x_1 + x_2 \leq 7$$
$$2x_1 \leq 11$$
$$x_1, x_2 \geq 0 \text{ and integers}$$

(c) Solve the following pre-emptive goal programming problem. **10**

Min $z = p_1 d_3^+ + p_2 d_2^-$

Subject to constraints

$$2x_1 + 3x_2 \leq 60$$
$$2x_1 + 5x_2 + d_1^- - d_1^+ = 80$$
$$3x_1 + 6x_2 + d_2^- - d_2^+ = 200$$
$$d_1^+ + d_3^- - d_3^+ = 30$$
$$x_1, x_2, d_1^+, d_1^-, d_2^+, d_2^-, d_3^+, d_3^- \geq 0$$

4. List of activities for erecting a canteen in a factory is given below with other relevant details. Job A must precede all others while job E must follow others. Apart from this, jobs can run concurrently. **20**

Code	Job Description	Normal		Crash	
		Duration (days)	Cost (₹)	Duration (days)	Cost (₹)
A.	Lay foundation and build walls	5	3,000	4	4,000
B.	Tile roofing	6	1,200	2	2,000
C.	Instal Electricity	4	1,000	3	1,800
D.	Instal Plumbing	5	1,200	3	2,000
E.	Connect services to finish	3	1,600	3	1,600

(i) Draw the network and identify the critical path.

(ii) Crash the network fully to find out minimum duration.

(iii) If indirect costs are ₹ 300 per day, determine time-cost trade off for the project.

5. Attempt any **two** : **20**

(a) A real estate study was conducted in a small Louisiana city to determine what variables, if any, are related to the market price of a home. Several variables were explored, including the number of bedrooms, the number of bathrooms, the age of the house, the number of square feet of living space, the total number of square feet of space and the number of garages. Develop a regression model to predict the market price of a home by two variables, "total number of square feet in the house" and "the age of the house". The table gives the data for the three variables. **10**

	Market Price (₹ 100)	**Total Number of Square Feet**	**Age of House (years)**
	y	x_1	x_2
1.	63.0	1605	35
2.	65.1	2489	45
3.	69.9	1553	20
4.	76.8	2404	32
5.	73.9	1884	25
6.	77.9	1558	14
7.	74.9	1748	8
8.	78.0	3105	10
9.	79.0	1682	28
10.	83.4	2470	30
11.	79.5	1820	2
12.	83.9	2143	6
13.	79.7	2121	14
14.	84.5	2485	9
15.	96.0	2300	19

(b) From the following values prepare forecasts by the methods of exponential smoothing taking initial estimate as 100, the value of $\alpha = 0.4$ and an initial trend value zero. **10**

Time period	**Sales (₹ crores)**
1991	104
1992	108
1993	118
1994	115
1995	120
1996	122
1997	123
1998	125
1999	128
2000	130

(c) Give the data : **10**

Year :	2006	2007	2008	2009	2010	2011	2012
Sales (in lakhs ₹) :	21	21	30	29	62	68	91

(i) Fit a parabola of second degree, taking 2009 = 0.

(ii) Obtain the trend values for 2006 through 2012.

(iii) Forecast the sales for 2024.