(a) Draw an arrow diagram (network) for this project.

(b) Indicate the critical path.

(c) For each non-critical activity find the total and free float. 3+4+3

9. Assuming that the expected times are normally distributed, find the probability of meeting the schedule date as given for the network.

Activity (i–j)	Duration (days) Optimists	Most likely	Passimists
1–2	2	5	14
1–3	9	12	15
2–4	5	14	17
3–4	2	5	12
4–5	6	6	12
3–5	8	17	20

Scheduled project completion date is 30 days. Also find the date on which the project manager can complete the project with a probability of 0.90. 5+5

A **(Printed Pages 8)**

Roll No. _____

MS-3081

M.B.A. (Second Semester) Examination, 2015

Management Science

(CP-202)

Time Allowed : Three Hours] ***[Maximum Marks : 70***

Note : Attempt **five** questions in all. Question **No. 1** is **compulsory**. Select **one** question from each Unit. Use of Financial/Scientific calculators is permitted. Area under the normal curve table to be supplied.

1. Attempt **all** parts : 3×10=30

(a) How do we Transform an L.P. into standard form?

(b) What are the characteristics of Canonical form of an L.P.?

(c) What is an unbounded solution? When do we have it in the optimal solution table?

(d) What is a fixed charge problem? Give an example.

(e) Give an example of 0–1 Integer programming problem.

(f) Define 'total float', 'free-float', and 'independent float' in the context of a project network.

(g) What do you mean by 'Queue Discipline'? Explain giving some business world example.

(h) Explain the following terms :

(i) Two-person zero-sum game

(ii) Principle of dominance

(iii) Pure strategy in a game theory problem.

(i) Give two examples of business applications of assignment problem.

(j) Solve the following L.P. problem graphically (without using a graph paper)

Unit - IV

8. A company has decided to add a new product to its line. It will buy the product from a manufacturing concern, package it, and sell it to a number of distributors that have been selected on a geographical basis. The steps shown in the following table are to be planned :

Activity	Description	Duration (days)	Predecessors
A	Organise sales force	6	—
B	feire salesman	4	A
C	Train Salesman	7	B
D	Select advertising agency	2	A
E	Plan adv. Compaign	4	D
F	Conduct adv. Compaign	10	E
G	Design Package	2	—
H	Setup packaging for citities	10	G
I	Package initial stock	6	J,H
J	Order Stock from manufacture	13	—
K	Select distributors	9	A
L	Sell to distributors	3	CK
M	ship stock to distributors	5	I, L

Unit-II

4. The products of three plants X, Y and Ƶ are to be transported to four warehouses I, II, III and IV. The cost of transportation of each unit from plants to the warehouses along with the normal capacities of plants and warehouses are indicated below :

		Warehouse I	II	III	IV	
Plant	X	25	17	25	14	300
	Y	15	10	18	24	500
	Ƶ	16	20	8	13	600
Required		300	300	500	500	

Solve the problem for minimum cost of transportation. Are there any alternative solutions? 10

5. (a) The secretary of a School is taking bids on the city's four school bus routes. Four companies have submitted the bids (in Rs.) a detailed in the table below :

		Route1	Route 2	Route 3	Route 4
Bus	1	4000	5000	—	—
	2	—	4000	—	4000
	3	3000	—	2000	—
	4	—	—	4000	5000

If each bidder can be assigned only one route, minimise the cost of running the four bus routes. 5

(b) A construction company has requested bids for contracts on five different projects. Five companies have responded. Their bids are represented below :

Bid Amount ('000 Rs.)

		I	II	III	IV	V
Bidder	1	41	72	39	52	25
	2	22	29	49	65	81
	3	27	39	60	51	40
	4	45	50	48	52	37
	5	29	40	45	26	30

Determine the minimum cost assignment of contracts to bidders, assuming that each bidder can receive only one contract. 5

Unit-III

6. People arrive at a theater ticket center in a Poisson distributed arrival rate of 25 per hour. Service time is constant at 2 minutes.

   Calculate :

   (i) the mean number in the waiting time

   (ii) the mean waiting time

   (iii) utilisation factor (ρ) 4+3+3

7. Two competitors are competing for the market share of similar products. The pay off matrix in terms of their advertising budget is shown below :

	Competitor B		
Competitor A	No Adv.	Medium Adv.	Heavy Adv.
No. Adv.	10	5	−2
Medium Adv.	13	12	13
Heavy Adv.	16	14	10

   Suggest optimal strategies for the two firms and the net outcome there of. 10

$$\text{Max } Z = -x_1+2x_2$$

$$\text{Sub. to : } x_1-x_2 \le -1$$

$$-0.5x_1 + x_2 \le 2$$

$$x_1, x_2 \ge 0$$

Unit-I

2. Solve the following L.P. using simplex method :

$$\text{Max. } Z = 3x_1+9x_2$$

$$\text{S.t : } x_1+4x_2 \le 8$$

$$x_1 + 2x_2 \le 4$$

$$x_1, x_2 \ge 0$$

10

3. A firm manufactures two products A and B on machines I and II Co shown below :

	Products		Available
Machine :	A	B	Hours
I	30	20	300
II	5	10	110
profit per unit	6	8	

   Total time available is 300 hours and 110 hours on machines I and II respectively. products A and B contribute C profit of Rs. 6 and Rs. 8 per unit respectively. Determine the optimum product mix. Also write the dual of this L.P. problem and give its economic interpretation. 10