VPM's
DR VN BRIMS, Thane
Programme: PGDM (2016-18)
Second Trimester Examination January 2017

Subject	**Quantitative Techniques II**		
Roll No.		**Marks**	**60 Marks**
Total No. of Questions	**7**	**Duration**	**3 Hours**
Total No. of printed pages		**Date**	**9.01.2017**

Note: Q1 is compulsory and solve any FOUR from the remaining SIX questions.

Q1) 20 Marks (Compulsory)

a) Solve the following LPP using the Simplex Method :

Maximize Z = 12x + 16y
Subject to 10x + 20y <= 120
8x + 8y <= 80
x, y >= 0

b) The cost to perform different jobs by different workers is given as follows :

	J1	**J2**	**J3**	**J4**
W1	90	18	48	50
W2	72	28	85	80
W3	53	92	12	78
W4	20	70	70	25

Obtain the optimal assignment of jobs to workers, by using Branch and Bound Method.

Attempt Any FOUR from the Remaining SIX Questions

Q2) *Any two from (a) or (b) or (c) ————— (5x2) = 10 Marks*

a) A firm is engaged in producing two products A and B. Each unit of product A requires 2 kg of raw material and 4 labour hours for processing, whereas each unit of product B requires 3 kg of raw material and 3 hours of labour. Every week the firm has an availability of 60 kg of raw material and 96 labour hours. One unit of product A sold yields Rs. 40 and one unit of product B sold gives Rs. 35 as profit.
Formulate this problem as linear programming problem to determine as to how many units of each of the products should be produced per week so that the firm can earn maximum profit.

b) The Agricultural Research Institute suggested to a farmer to spread out at least 4800 kg of a special phosphate fertiliser and not less than 7200 kg of a special nitrogen fertiliser to raise productivity of crops in his fields. There are two sources for obtaining these – mixtures A and B. Both of these are available in bags weighing 100 kg each and they cost Rs. 40 and Rs. 24 respectively. Mixture A contains phosphate and nitrogen equivalent of 20kg and 80kg respectively, while mixture B contains these ingredients equivalent to 50 kg each.
Write this as a linear programming problem to determine how many bags of each type the farmer should buy in order to obtain the required fertiliser at minimum cost.

c) Solve graphically :

Minimize Z = 6x + 14y
Subject to 5x + 4y >= 60
3x + 7y <= 84
x + 2y >= 18
x, y >= 0

Q3) *Any two from (a) or (b) or (c) ————— (5x2) = 10 Marks*

a) Solve the following LPP, using Simplex Method :

Maximize Z = 8p – 4q + 4r
Subject to 4p + 5q – 5r <= 20
p – 3q + 3r <= 23
p, q, r >= 0

b) Solve the following LPP, using Simplex Method :

$$\text{Maximize } Z = 6p + 20q + 248$$
$$\text{Subject to } \quad 2p + q \le 6$$
$$3p + 4q \le 16$$
$$p, q \ge 0$$

c) Solve the following LPP, using Simplex Method :

$$\text{Maximize } Z = 30p + 40q + 35r$$
$$\text{Subject to } \quad 3p + 4q + 2r \le 90$$
$$2p + q + 2r \le 54$$
$$p + 3q + 2r \le 93$$
$$p, q, r \ge 0$$

Q4) ***Any two from (a) or (b) or (c) ———— (5x2) = 10 Marks***

a) A firm has manufacturing plants at places A, B and C with daily output of 500, 300 and 200 units respectively. It has warehouse at places P, Q, R and S with daily requirements of 180, 150, 350 and 320 units respectively. Per unit shipping charges on different routes are given below:

	P	**Q**	**R**	**S**
From A	12	10	12	13
From B	7	11	8	14
From C	6	16	11	7

The firm wants to send the output from various plants to warehouses involving minimum transportation cost.

How should it route the product so as to achieve its objective?

Solve this Transportation problem, using North-West Corner method.

b) Solve the above question Q.4. (a) by using Least Cost Method of Transportation.

c) Solve the above question Q.4. (a) by using Vogel's Approximation Method (VAM) of Transportation.

Q5) ***Any two from (a) or (b) or (c) ———— (5x2) = 10 Marks***

a) 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 paise 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 magazine are 40, 30 and 20 millions, respectively. Also, the minimum desired exposures within each 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 obtaining the desired minimum exposure level in each age group.

	Age 13-18	**Age 19-25**	**Age 26-35**	**Age 36 and older**
TV	12	7	10	10
Radio	10	9	12	10
Magazine	14	12	9	12

Formulate the above as a Transportation problem and find the optimal solution, by using North-West Corner method.

b) Solve the above question Q.5. (a) by using Least Cost Method of Transportation.

c) Solve the above question Q.5. (a) by using Vogel's Approximation Method (VAM) of Transportation.

Q6) ***Any two from (a) or (b) or (c) ———— (5x2) = 10 Marks***

a) Solve the following assignment problem, by using Hungarian Assignment Method :

	J1	J2	J3	J4	J5
Person A	10	3	3	2	8
Person B	9	7	8	2	7
Person C	7	5	6	2	4
Person D	3	5	8	2	4
Person E	9	10	9	6	10

b) Solve the following assignment problem, by using Hungarian Assignment Method :

	Job A	Job B	Job C	Job D
Worker A	45	40	51	67
Worker B	57	42	63	55
Worker C	49	52	48	64
Worker D	41	45	60	55

c) Solve the following assignment problem, by using Hungarian Assignment Method :

	J1	J2	J3	J4	J5
Worker A	25	18	32	20	21
Worker B	34	25	21	12	17
Worker C	20	17	20	32	16
Worker D	20	28	20	16	27

Q7) *Any two from (a) or (b) or (c) ———— (5x2) = 10 Marks*

a) Solve the following LPP graphically:

Minimize $Z = 3x + 5y$

Subject to

$-3x + 4y <= 12$

$2x - y >= -2$

$2x + 3y >= 12$

$x <= 4$

$y >= 2$

$x, y >= 0$

b) Solve the following Transportation problem, by any one method :

	Destination P	Destination Q	Destination R	Destination S	Supply
Source A	6	11	9	8	200
Source B	13	10	8	15	300
Source C	9	9	14	12	500
Source D	12	10	12	10	100
Demand	350	250	300	200	

c) Solve the following Assignment problem, by HAM :

	Leasing	Portfolio Mgmt	Mutual Funds	Options
Monday	50	40	60	20
Tuesday	40	30	40	30
Wednesday	60	20	30	20
Thursday	30	30	20	30
Friday	10	20	10	30