U.S.N

P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Second Semester, Master of Business Administration (MBA)

Semester End Examination; June - 2017

Quantitative Techniques - II

Time: 3 hrs *Max. Marks: 100*

*Note: i) Answer all **FOUR** full questions from **PART - A** and **PART - B** (Case study) is compulsory.*
ii) Scientific calculator and Normal distribution table shall be allowed.
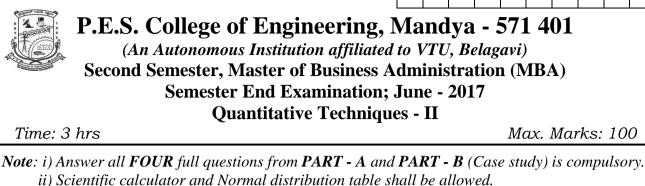
PART - A

1 a. Write a note on statistical independence of events under three types of probabilities. 10

b. The following table shows the number of customers returning the products in a market territory. The data is set for 100 stores. 10

No. of returns	0	1	2	3	4	5	6
No. of stores	4	14	23	23	18	9	9

Fit a Poisson distribution.

OR

2 a. The personnel department of a company has records which show the following analysis of its 200 engineers.

Age	Bachelor's Degree only	Master's Degree	Total
Under 30	90	10	100
30 to 40	20	30	50
Over 40	40	10	50
Total	150	50	200

10

If one engineer is selected at random from the company, find :

i) The probability that he has only a bachelor's degree

ii) The probability that he has a master's degree, given that he is over 40

iii) The probability that he is under 30, given that he has only a bachelor's degree.

b. In a bolt factory, machines A, B and C manufacture 25 percent, 35 percent and 40 percent of the total output respectively. Of the total of their output 5, 4 and 2 percent are defective bolts. A bolt is drawn at random and is found to be defective, what is the probability that it was manufactured by machines A, B or C? 10

3 a. What is linear programming? What are its major assumptions and limitations? 10

b. A company has two plants, each of which produces and supplies two products: A and B. The plants can each work upto 16 hours a day. In plant 1, it takes three hours to prepare and pack 1,000 gallons of A and one hour to prepare and pack one quintal of B. In plant 2, it takes two hours to prepare and pack 1,000 gallons of A and 1.5 hours to prepare and pack a quintal of B. 10

In plant 1, it costs ₹ 15,000 to prepare and pack 1,000 gallons of A and ₹ 28,000 to prepare and pack a quintal of B, whereas in plant 2 these costs are ₹ 18,000 and ₹ 26,000 respectively. The company is obliged to produce daily at least 10 thousand gallons of A and 8 quintals of B. Formulate this problem as an LP model to find out as to how the company should organize its production, so that the required amounts of the two products be obtained at the minimum cost?

OR

4 a. Discuss and describe the roles of linear programming in managerial decision-making, bringing out limitations, if any.   10

   b. Use the graphical method to solve the following LPP problem :

   Minimize $Z = 3x_1 + 2x_2$ subject to the constraints,   10

   i) $5x_1 + x_2 \geq 10$ ii) $x_1 + x_2 \geq 6$ iii) $x_1 + 4x_2 \geq 12$ and $x_1, x_2 \geq 0$.

5 a. Explain the various steps involved in solving transportation problem using,   10

   i) Least cost method   ii) Vogel's approximation method.

   b. Find the initial feasible solution by Vogel's approximation method.

Plant	Warehouse				Supply
	W_1	W_2	W_3	W_4	
P_1	48	60	56	58	150
P_2	45	55	53	60	250
P_3	50	65	60	62	350
P_4	52	64	55	61	250
Demand	200	250	250	200	1000

10

OR

6 a. Illustrate the opportunities and short coming of the operations research model.   10

   b. Solve the following game :

		Player Y				
		Y_1	Y_2	Y_3	Y_4	Y_5
Player X	X_1	-2	0	0	4	2
	X_2	3	2	1	2	3
	X_3	-4	-3	0	-3	5
	X_4	5	3	-5	2	-6

10

7 a. Explain in detail the methodology of operations research.   10

   b. Solve the following assignment problem.

Salesman	Territory			
	P	Q	R	S
A	42	35	28	21
B	30	25	20	15
C	30	25	20	15
D	24	20	16	12

10

Unit entries represent sales expenses in ₹ 1000.

OR

8 a. A company is currently involved in negotiations with its union on the upcoming wage contract. Positive sign in table represent wage increase while negative sign represents wage reduction. What are the optimal strategies for the company as well as the union? What is the game value?

10

Conditional costs to the company (₹ in Lakhs)

		Union Strategies			
		U_1	U_2	U_3	U_4
Company Strategies	C_1	0.25	0.27	0.35	- 0.02
	C_2	0.20	0.06	0.08	0.08
	C_3	0.14	0.12	0.05	0.03
	C_4	0.30	0.14	0.19	0.00

b. The extension counter of the citizen's bank in the premises of a state university enrolls all new customers (students) in savings bank accounts. In the month of August, as the colleges in the university begin the classes, a lot of new accounts have to be opened for new students enrolled. The bank manager estimates that the arrival rate during this period will be Poisson distributed with an average arrival of 3 customers per hour and service rate being exponentially distributed with a mean of 15 minutes per customer to set up a new account. The bank manager wants to determine the operating characteristics for this time system to know whether the current strength of one server is sufficient to handle the increased traffic.

10

PART - B
Case study (Compulsory question)

9. Two persons X and Y work on a two-station assembly line. The distribution of activity at their stations are

Time (in seconds)	Time frequency for X	Time frequency for Y
10	4	2
20	7	3
30	10	6
40	15	8
50	35	12
60	18	9
70	8	7
80	3	3

20

(i) Simulate operation of the line for eight items

(ii) Assuming Y must wait until X completes the first item before starting work, will he has to wait to process any of the other seven items? What is the average waiting time of items?

Use the following random numbers:

              For X: 83   70   06   12   59   46   54 and 04

              For Y: 57   99   84   81   15   36   12 and 54

(iii) Determine the inventory of items between the two stations.

(iv) What is the average production rate?

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