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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; October -2022

Quantitative Techniques

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 calculators are allowable. Normal distribution table are allowable.

Q. No.	Questions	Marks	BLs	COs
	PART - A			
1 a.	Assume that a factory has 2 machines. Past records show that a machine 1 produces 30% of the items of output and machine 2 produces 70% of the items. Further, 5% of the items produced by machine 1 were defective and only 1% produced by machine 2 were defective. If a defective item is drawn at random, what is the probability that the defective item was produced by machine 1 or 2?	10	L6	CO2
b.	The personnel department of a company has records which show the following analysis of its 200 engineers.	10	L6	CO3

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

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 the he is over 40

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

OR

2 a.	List out the properties of Normal distribution.	10	L4	CO1
b.	A multiple choice test contains 8 questions with 3 answers to each question (of which only one is correct). A student answers each questions by rolling a balanced dice and checking the first answer if he get 1 or 2, the second answer if he gets 3 or 4, and the third answer if he gets 5 or 6. To get a distinction, the student must secure at least 75 percent correct answers. If there is no negative marking, what is the probability that the students secure a distinction?	10	L2	CO1
3 a.	Elaborate the applications of OR in any two fields of Business.	10	L6	CO5

Contd… 2

b. Obtain the optimal strategies for both persons and the value of the game for two-person zero-sum whose payoff matrix is as follow:

	Player B	
Player A	B_1	B_2
A_1	1	–3
A_2	3	5
A_3	–1	6
A_4	4	1
A_5	2	2
A_6	-5	0

10 L3 CO2

OR

4 a. Demonstrate the rule of Dominance in order to obtain the value of the Game and optimum strategies of players. 10 L4 CO2

b. Solve the problem using Rule of Dominance

	B_1	B_2	B_3	B_4	B_5
A_1	–2	0	0	5	3
A_2	3	2	1	2	2
A_3	–4	–3	0	–2	6
A_4	5	3	–4	2	–6

10 L6 CO2

5 a. Explain the components of Queuing system. 10 L2 CO1

b. Arrivals at telephone booth are considered to be poisoned with an average time of 10 min. Between one arrival and next. The length of phone calls is assumed to be distributed exponentially, with a mean of 3 min.

i) What is that a person arriving at the booth will have to wait?

ii) The telephone department will install a second booth convinced that an arrival would have expected waiting line for at least 3 min for a phone call. By how much should the flow of arrivals increasing in order to justify a second booth?

iii) What is the average length of queue that forms from time to time?

10 L1 CO5

OR

6 a. Use graphical method to solve the following LP problem.

Maximize $Z = 15x_1+10x_2$

Subject to the constraints:

i) $4x_1+6x_2 \leq 360;$

ii) $3x_1+0x_2 \leq 180;$

iii) $0x_1+5x_2 \leq 200$ and $x_1, x_2 \geq 0.$

10 L6 CO3

Contd… 3

b. The manufacturer of a patent a medicines is proposed to prepare a production plan for medicines A and B. There is sufficient ingredient available to make 20,000 bottles of machine A and 40,000 bottles of medicines B, but there are 45,000 bottles into which either of medicine can be filled. Further, it takes 3 hours to prepare enough material to fill 1000 bottles of medicine A and one hour to prepare enough material to fill 1000 bottles of medicine B, and there are 66 hours available for this operation. The profit is Rs. 8 per bottle for medicine A and Rs. 7 per bottle for medicine B. Formulate this problem as LPP. 10 L6 CO3

7 a. A departmental head had four subordinates and four tasks to be performed. The subordinates differ in efficiency and the task in their intrinsic difficulty. His estimates of the times that each man would take to perform each task is given in the matrix below:

Subordinates	Tasks			
	I	II	III	IV
A	8	26	17	11
B	13	28	4	26
C	38	19	18	15
D	19	26	24	10

10 L6 CO4

Propose an Optimum allotment of task to subordinates so as to minimize the total man-hour.

b. Outline the difference between Transportation and Assignment problem. 10 L2 CO

OR

8 a. Illustrate the methods of finding Basic feasible Solution. 10 L2 CO4

b. Develop an optimal solution for the following transportation Problem:

	P	Q	R	S	Supply
A	5	7	13	10	700
B	8	6	14	13	400
C	12	10	9	11	800
Demand	700	600	100	400	

10 L6 CO4

Contd… 4

PART - B (Case Study Compulsory)

9. Dr. Strong is a dentist who schedules all his patients for 30 min. appointments some of patients take more or less than 30 min. depending on the type of dental work to be done. The following summary shows the various categories of work. Their probability and the time actually needed to complete the work. Their probability and the time actually needed to complete the work.

Category	Time required	P_i of Category
Filling	45 min.	0.40
Crown	60 min.	0.15
Cleaning	50 min.	0.15
Extraction	45 min.	0.10
Check-up	15 min.	0.20

Stimulate the dentists for 4 hours. Assume that all the patients show up at the clinic at exactly their scheduled arrival time starting at 8.00 am. Use the following random number of simulation - 40, 82, 11, 34, 25, 60, 17, 79.

a) Estimate the random number for the given probability distribution. 8 L5 CO3

b) Estimate the average waiting time for the patient. 6 L5 CO3

c) Estimate the idleness of the doctor. 6 L3 CO5

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