BMS COLLEGE OF ENGINEERING, BENGALURU-19
Autonomous Institute, Affiliated to VTU
DEPARTMENT OF MATHEMATICS

Sem& Branch:	**Third Semester CSE/ISE**	**Subject:**	**STATISTICS AND DISCRETE MATHEMATICS**	**Sub Code:**	**19MA3BSSDM**
Time:	**1:00 PM-2:15 PM**	**Test Date:**	**19/02/2021**	**Max Marks:**	40

Test No.	Q. No.	**ANSWER ALL QUESTIONS** **(Questions in Part-A and Part-B are compulsory. Internal choice is provided in Part C)**	Marks	CO
Test -3		**PART-A**		
	1	A cell phone company believes that the proportion of households that have three cell phones is 30%. Suppose a consumer group suspects that the proportion of households that have three cell phones is not known to be 30%. Their marketing people survey 150 households with the result that 43 of the households have three cell phones. Test the company's claim.	**5**	3
		PART-B		
	2	a) A nutritionist is interested in whether two proposed diets, A and B work equally well in providing weight-loss for customers. In order to assess a difference between the two diets, she puts 50 customers on Diet A and 60 other customers on the Diet B diet for two weeks. Those on the former had weight losses with an average of 11 pounds and a standard deviation of 3 pounds, while those on the latter lost an average of 8 pounds with a standard deviation of 2 pounds. Do the diets differ in terms of their weight loss?	**5**	3
		b) Students arrive at the admission section of BMSCE according to a Poisson input process with a mean rate of 30 per day. The time required to serve a student has an exponential distribution with a mean of 36 minutes. Assume that the students are served by a single individual with an infinite queue capacity. Find the following: (i) The probability of no student in the queue. (ii) The average waiting time in the queue before the service.	**5**	3
		c) An auto insurance company classifies its customers in three categories: poor, satisfactory and preferred. No one moves from poor to preferred or from preferred to poor in one year. 40% of the customers in the poor category become satisfactory, 30% of those in the satisfactory category moves to preferred, while 10% become poor; 20% of those in the preferred category are downgraded to satisfactory. (i) Write the transition matrix for the model. (ii) Is the Markov chain irreducible?	**5**	3

PART-C

3

a) The risk of investing in a stock is measured by the volatility, or the variance, in changes in the price of that stock. Mutual funds are baskets of stocks and offer generally lower risk to investors. Different mutual funds have different focuses and offer different levels of risk. Hippolyta is deciding between two mutual funds, A and B, with similar expected returns. To make a final decision, she examined the annual returns of the two funds during the last ten years and obtained the following information:

	n	variance
Mutual Fund A- Sample 1	10	2.15
Mutual Fund B- Sample 2	31	3.91

Test, at the 5% level of significance, whether the data provide sufficient evidence to conclude that the variability in the two mutual funds differ.

OR

b) Children in two elementary school classrooms were given two versions of the same test, but with the order of questions arranged from easier to more difficult in Version *A* and in reverse order in Version *B*. Randomly selected students from each class were given Version *A* and the rest Version *B*. The results are shown in the table.

	n	**mean**	***SD***
Version *A*	31	83	4.6
Version *B*	32	78	4.3

Test at the 1% level of significance the hypothesis that the *A* version of the test is easier than the *B* version (even though the questions are the same).

6 | 3

4

a) Our observations on one cashier in a supermarket have shown that the arrival distribution of customers follows Poisson distribution with arrival rate of 5 per minutes. The distribution of service time follows Exponential distribution with average service time 1.079 minutes per customer. Find the

(i) Average waiting time a customer spends in waiting line.
(ii) Average number of customers in the system.
(iii) What is the probability that there are 6 customers in the system?
(iv) What is the probability that there are no customers in the system?

7 | 3

OR

		b) Assume that a man's profession can be classified as professional, skilled labourer, or unskilled labourer. Assume that, of the sons of professional men, 80 percent are professional, 10 percent are skilled labourers, and 10 percent are unskilled labourers. In the case of sons of skilled labourers, 60 percent are skilled labourers, 20 percent are professional, and 20 percent are unskilled. Finally, in the case of unskilled labourers, 50 percent of the sons are unskilled labourers, and 25 percent each are in the other two categories. Assume that every man has at least one son, and form a Markov chain by following the profession of a randomly chosen son of a given family through several generations. Set up the matrix of transition probabilities. (i) Find the probability that a randomly chosen grandson of an unskilled labourer is a professional man. (ii) In the long run, what is the probability that a great grandson of a skilled labourer is a professional man.		
	5	a) Suppose the Cartoon Network conducts a nation-wide survey to assess viewer attitudes toward Superman. Using a simple random sample, they select 400 boys and 300 girls to participate in the study. Forty percent of the boys say that Superman is their favorite character, compared to thirty percent of the girls. Is there any significant indication that boy's prefer superman than girl's?	**7**	3
		OR		
		b) The number of cars passing a given point in 100 five second interval was observed as follows. No of Cars: 0 | 1 | 2 | 3 | 4 | 5 No of intervals: 40 | 23 | 15 | 5 | 7 | 10 Fit a Poisson distribution and test for its goodness of fit.		

Course Outcome:	
CO 3	Apply the concepts for probability, Statistics and Queuing theory.