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NIST INSTITUTE OF SCIENCE & TECHNOLOGY
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B. Tech 3rd Semester (2022 Batch)		Branch(s)	CSE,CST,IT ,ECS,ECE
Subject Code	22CM3BS01T	Subject Name	Mathematics-III
Time	90 min	Exam	Mid Semester	Max. Marks	50
Examination Superintendent		Prof. Chittaranjan Biswal	
Name of the Instructor(s)		Dr.M.Rajendra Kumar, Dr.Subrata Ku Sahu, Dr. Deepak Ku Acharya, Dr.Y.Sankar Rao, Dr.Runu Sahu, Dr.S.S. Bishoyi .	
Date of Examination		23-11-2023	Sitting	1st

Answer Question No.1 from PART-I which is compulsory, any four from PART-II and any one from PART-III.
The figures in the right hand margin indicate marks.

PART-I

(Answer all the questions)

Q1.		CO	Level	Level-1: Knowledge Level-2: Comprehension Level-3: Application Level-4: Analysis Level-5: Synthesis Level -6: Evaluation	2 X 5
	(a)	1	1	A random variable X has the probability function Calculate mean.	
	(b)	1	2	A coin is tossed once. What is the random variable associate with happening of a head.	
	(c)	2	1	A continuous random variable X has the probability density function $f(x) = \frac{k}{1+x^2}$, $-\infty < x < \infty$ Find k.	
	(d)	2	1	Write the probability mass function for Poisson distribution.	
	(e)	2	1	If the mean is 4 and variance is 5 of a random variable X, check whether X follows binomial distribution.	

For Q1(a):

x	-2	-1	0	1	2	3
P(x)	0.1	k	0.2	2k	0.3	k

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(Answer Any four questions out of six)

Q2.		CC	Level	Level-1: Knowledge Level-2: Comprehension Level-3: Application Level-4: Analysis Level-5: Synthesis Level -6: Evaluation	4 X 6
	(a)	1	1	In 256 sets of 12 tosses of a fair coin, in how many cases one expects 8 heads and 4 tails	
	(b)	2	2	Three urns A_1, A_2, A_3 contains respectively 3 red,4 white,1 blue; 1 red,2 white,3 blue;,4 red,3 white, 2 blue balls. One urn is chosen at random and a ball is drawn, it is found to be red. Find the probability that it comes from the urn A_1.	
	(c)	2	3	A car hire firm has 2 cars. The number of demands for a car on each day is distributed as Poisson variate with mean 0.5. Calculate the proportion of days on which (i) neither car is used (ii) some demand is refused	
	(d)	1	3	Trains arrive at a station at 15 minutes interval starting at 4.a.m. If a passenger arrives at a station at a time that is uniformly distributed between 9.00 and 9.30, find the probability that he has to wait for the train for (i) less than 6 minutes (ii) more than 10 minutes	
	(e)	1	2	A random variable X has the following probability distribution | r	1	2	3	4
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P(r)	k	8k	27k	64k | Find the mean and variance of X.	
	(f)	2	1	If X has an exponential distribution with mean=2, find $P(X < 1/X < 2)$	

PART-III

(Answer Any One question out of two)

		CO	Level	Level-1: Knowledge Level-2: Comprehension Level-3: Application Level-4: Analysis Level-5: Synthesis Level -6: Evaluation	1 X 16
Q3.	(a)	2	3	If the probability of a bad reaction from a certain injection is 0.001, what is the chance that out of 2000 individuals , more than two will get a bad reaction?	
	(b)	1	3	In a test on 2000 electric bulbs, it was found that the life of a particular make was normally distributed with an average life of 2040 hours and SD of 60 hours. Estimate the number of bulbs likely to burn for (i) more than 2150 hours (ii) less than 1950 hours, and (iii) more than 1920 hours but less than 2160 hours	
Q4.	(a)	1	2	The mileage which car owners get with certain kind of radial tyre is a random variable having an exponential distribution with mean 40000 km. Find the probabilities that one of these tyres will last (i) at least 20000 km, and (ii) at most 30000 km.	
	(b)	2	1	Define continuous uniform distribution and find its mean and variance.	