BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: IMSc | **SEMESTER : VIII**
BRANCH: MATHS & COMP. | **SESSION : SP/2023**

SUBJECT: MA413 STOCHASTIC PROCESS & SIMULATION

TIME: 3 Hours | **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	Find the mean and variance of exponential distribution using the concept of probability generation function.	[5]	1	1.10
Q.1(b)	Define Laplace transform for a random variable. Use it to find the mean and variance of Binomial distribution.	[5]	1	1.31
Q.2(a)	Define a stochastic process. Mention the different categories into which a stochastic process can be classified with one example of each category.	[5]	2	1.23
Q.2(b)	Let X_n, n≥1 be uncorrelated random variables with mean 0 and variance 1. Verify if the process { X_n, n≥1} is covariance stationary.	[5]	2	1.30
Q.3(a)	Define a random walk and show that the position X_n of a particle after n steps in a random walk between two absorbing barriers constitutes a Markov chain.	[5]	3	1.20
Q.3(b)	What do you mean by order of a Markov chain? How is this order determined?	[5]	3	1.12
Q.4(a)	Describe a Poisson Process explaining its postulates clearly.	[5]	4	1.23
Q.4(b)	Suppose that customers arrive at a service counter in accordance with a Poisson Process with mean rate of 2 per minute. Then in an interval of 3 minutes, what is the probability that (i) exactly 4 customers will arrive? (ii) less than 4 customers will arrive? (iii) more than 4 customers will arrive?	[5]	4	1.25
Q.5(a)	Write an algorithm to simulate a random variable X whose distribution is given below: x: 0 1 2 3 4 P(X=x): 3/19 6/19 4/19 5/19 1/19	[5]	5	1.25
Q.5(b)	Given a uniform variate u=0.4125, use it to simulate a Poisson variate with mean 2.	[5]	5	1.32

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