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

CLASS: BTECH **SEMESTER: IV**
BRANCH: ECE **SESSION : SP/2020**

SUBJECT : EC251 PROBABILITY AND RANDOM PROCESSES

TIME: 2 HOURS **FULL MARKS: 25**

INSTRUCTIONS:
1. The total marks of the questions are 25.
2. Candidates may attempt for all 25 marks.
3. Before attempting the question paper, be sure that you have got the correct question paper.
4. The missing data, if any, may be assumed suitably.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

				CO	BL
Q1	(a)	Determine the condition for the two events A and B, when they are equal with probability 1.	[2]	1	V
Q1	(b)	Two players A and B draw balls one at a time alternatively from a box containing ‘m’ white balls and ‘n’ black balls. Suppose the player who picks the first white ball wins the game. What is the probability that the player who starts the game will win?	[3]	1	I
Q2	(a)	Explain Total Probability theorem and formulate the Bayes’ theorem.	[2]	1	VI
Q2	(b)	Three switches (S1, S2, and S3) connected in parallel operate independently. Each switch remains closed with probability p. Determine the probability that switch S1 is open given that an input signal is received at the output.	[3]	1	V
Q3	(a)	Define probability density function of Gamma Distribution of random variable ‘X’ and find its probability distribution function?	[2]	1	I
Q3	(b)	Find the variance of normal distribution function $X \sim N(\mu, \sigma^2)$	[3]	1	I
Q4	(a)	Explain the characteristics function of a random variable X and state any two properties	[2]	1	II
Q4	(b)	The characteristics function of a random variable X is given by $\varphi_X(\omega) = \frac{1}{(1-j2\omega)^{\frac{N}{2}}}$. Find the mean and second moment of X.	[3]	1	I
Q5	(a)	The joint PDF of a bivariate random variable (X,Y) is given by $f_{X,Y}(x,y) = \begin{cases} ke^{-(ax+by)} & x > 0, y > 0 \\ 0 & otherwise \end{cases}$ Determine the value of k, Are X and Y independent? And determine P(Y<X)	[2]	2	V
Q5	(b)	If a joint pdf of two random variable X and Y is given by $f(x,y) = f_X(x)f_Y(y)[1 + \rho\{2F_X(x) - 1\}\{2F_Y(y) - 1\}]$, where $\|\rho\| < 1$ and $f_X(x)$ and $f_Y(y)$ are two pdfs with distribution functions $F_X(x)$ and $F_Y(y)$. Determine the marginal pdfs of $f(x,y)$	[3]	2	V

:::::: 27/02/2020 ::::::E