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

CLASS: IMSc.   SEMESTER: III
BRANCH: QEDS   SESSION: MO/2022

SUBJECT: ED207 PROBABILITY II

TIME: 2 HOURS   FULL MARKS: 25

INSTRUCTIONS:
1. The total marks of the questions are 25.
2. Candidates 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.

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Q1 (a) The joint probability distribution of two discrete random variables is   [2] CO1

$$f(x,y) = \begin{cases} \frac{1}{4}, & x = 1, y = 0 \\ \frac{1}{4}, & x = 2, y = 3 \\ \frac{1}{2}, & x = 3, y = 5 \end{cases}$$

Obtain the marginal distribution of Y

Q1 (b) Find Cov(X,Y).   [3] CO1

Q2 (a) The following two-way table shows the results of a survey that asked 100 people [2] CO1
         which sport they liked best: baseball, basketball or football.

	Baseball	Basketball	Football	Total
Male	13	15	20	48
Female	23	16	13	52
Total	36	31	33	100

Given that an individual is male, what is the probability that baseball is their favorite sport?

Q2 (b) Check whether Baseball and Male are dependent or not.   [3] CO1

Q3 (a) Suppose that T has the exponential distribution with rate parameter λ. Find the pdf [2] CO1
         of $X = e^T$.

Q3 (b) Also, find the pdf of $Y = \ln T$.   [3] CO1

Q4 (a) Let Y_1 and Y_2 be independent each with density $1/y^2$, y > 1. Consider the [2] CO1
         transformation $U_1 = Y_2 / (Y_1 + Y_2)$ and $U_2 = Y_1 + Y_2$. Find the joint density of U_1 and U_2.

Q4 (b) Also find the marginal density of U_1.   [3] CO1

Q5   Let X be $N_3(\mu,\Sigma)$, where μ = (-3,1,4)' and $\Sigma = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 3 & 2 \\ 1 & 2 & 2 \end{bmatrix}$. Find the distribution of $3X_1 - 2X_2 + X_3$.   [5] CO2

:::::: 28/09/2022 ::::::M