Date of Exam - 09.11.2021

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY VADODARA

MID-SEMESTER EXAM: AUTUMN 2021

B.TECH. III SEMESTER (GANDHINAGAR & DIU CAMPUS)

MA 201: PROBABILITY AND STATISTICS

MAX MARKS: 10
Duration: 40 MINUTES

INSTRUCTIONS -

1. ATTEMPT ALL FOUR QUESTIONS. ALL QUESTIONS CARRY **ALMOST** EQUAL MARKS.
2. USE OF SCIENTIFIC-CALCULATOR/MATLAB/OCTAVE IS ALLOWED ONLY FOR CALCULATION PURPOSES. THEREFORE, WRITE THE STEPS PROPERLY.
3. ATTEMPT ONE QUESTION AT ONE PLACE. TRY TO MAINTAIN THE QUESTION ORDERING.
4. WRITE YOUR ROLL NO AND PAGE NO WITH SIGN.
5. SCAN THE PDF FILE, RENAME IT AS **MA201_MIDSEMEXAM_YOURINSTITUTEID_NAME.PDF**
6. UPLOAD YOUR **MA201_MIDSEMEXAM_** FILE TO THE GOOGLE-FORM. 15 MINUTES IS GIVEN FOR UPLOADING.

Qus - 1: A continuous random variable X has p.d.f. $f_X(x) = 3x^2,\ 0 \le x \le 1.$

(a) Find a such that $\Pr\{X > a\} = \frac{26}{27}$.

(b) Find b such that $\Pr\{X > b\} = 7\Pr\{X \le b\}$.

(OR)

Qus - 1: Two random variables, X and Y, have the joint distribution $P_{X,Y}(x, y)$,

$P_{X,Y}(x,y)$		x = 0	x = 1
y	0	0.4	0.3
	1	0.2	0.1

if $R = X + Y,\ S = \min(X, Y)$, and $T = \max(X, Y)$, write the joint distributions $P_{S,T}(s,t),\ P_{R,S}(r,s)$, and $P_{R,T}(r,t)$ in table form.

Qus - 2: The probability that a man aged 60 will live to be 70 is $p = \frac{2}{3}$. What is the probability that out of 10 men whose age is 60 now, at least 8 will live to be 70? **(WRITE THE STEPS CLEARLY, BEFORE CALCULATION)**

(OR)

Qus - 2: An insurance company found that only 0.01% of the population is involved in a certain type of accident each year. If its 1000 policy holders were randomly selected from the population, what is the probability that not more than two of its clients are involved in such an accident next year? **(WRITE THE STEPS CLEARLY, BEFORE CALCULATION)**

Qus -3: EITHER solve both 3a and 3b

3a: Students of a class were given an aptitude test. Their marks were found to be normally distributed with mean 60 and standard deviation 5. What percentage of students scored more than 60? **(WRITE THE STEPS CLEARLY, BEFORE CALCULATION)**

3b: A manufacturer knows from experience that the resistance of resistors he produces is normal with mean $100\,\Omega$ and standard deviation $2\,\Omega$. What percentage of resistors will have resistance between $98\,\Omega$ and $102\,\Omega$? **(WRITE THE STEPS CLEARLY, BEFORE CALCULATION)**

Hint: $\text{normcdf}(0, 0, 1) = 0.5, \quad \text{normcdf}(1, 0, 1) = 0.8413$

(OR)

Qus - 3: OR solve 3c only

3c: In a normal distribution, 30.85% of items are under 45 and 8.08% are over 64. Find the mean and standard deviation of the distribution. **(WRITE THE STEPS CLEARLY, BEFORE CALCULATION)**

Hint: $\text{norminv}(.3085, 0, 1) = -0.5$ and $\text{norminv}(1 - 0.0808, 0, 1) = 1.4$