VIT

Vellore Institute of Technology

# SCHOOL OF ADVANCED SCIENCES

**Fall Semester 2023-2024**

**Continuous Assessment Test – I**

**Programme Name & Branch** : **MCA – MASTER OF COMPUTER APPLICATIONS**

**Slot** : **D2+TD2**

**Course Name & code** : **PROBABILITY AND STATISTICS & PMAT501L**

**Class Number (s)** : **VL2023240106407 / 6408 / 6409**

**Faculty Name (s)** : **Dr. S. Kaspar / Dr. Rajesh Moharana / Dr.P. Ragukumar**

**Exam Duration: 90 Min.** **Maximum Marks: 50**

**General instruction(s): Answer ALL Questions**

| Q.No. | Question | Max Marks |
|---|---|---|
| 1. | (i) A sub-committee of 6 members is to be formed out of a group consisting of 7 men and 4 women. Calculate the probability that the sub-committee will consist of **(5 Marks)**<br>(a) exactly 2 women, (b) at least 2 women.<br>(ii) For two events $A$ and $B$, $P(A) = 0.5$, $P(B) = 0.6$ and $P(A \cap B) = 0.8$. Find the conditional probabilities $P(A\|B)$ and $P(B\|A)$. **(5 Marks)** | 5+5 |
| 2. | Data on readership of a magazine indicates that the proportion of male readers under 30 years is 0.20, above 30 years old is 0.30 and the proportion of male readers under 30 years is 0.20. If the proportion of readers under 30 is 0.80, what is the probability that a randomly selected male subscriber is under 30? | 10 |
| 3. | The probability function of a random variable $X$ is given by:<br><table><tr><td>X</td><td>-2</td><td>0</td><td>1</td><td>3</td><td>10</td></tr><tr><td>P(X)</td><td>$\frac{1}{5}$</td><td>$\frac{1}{4}$</td><td>$\frac{1}{20}$</td><td>$\frac{3}{8}$</td><td>$\frac{1}{8}$</td></tr></table>Evaluate (i) $P(X \leq 0)$ (ii) $P(X < 0)$ (iii) $P(\|X\| \leq 2)$ (iv) $P(0 \leq X \leq 10)$ | 10 |
| 4. | The joint density function of a bivariate distribution is given as<br>$$f(x,y) = \begin{cases} \frac{1}{3}(x+y) & 0 \leq x \leq 2, \quad 0 \leq y \leq 1 \\ 0 & otherwise \end{cases}$$<br>Determine the marginal distributions and show that $X$ and $Y$ are not independent. | 10 |
| 5. | A continuous random variable $X$ has the following PDF:<br>$$f(x) = \begin{cases} 3x^2 & 0 < x < 1 \\ 0 & otherwise \end{cases}$$<br>Evaluate the following probabilities.<br>(i) $P\left(X \leq \frac{1}{3}\right)$ (ii) $P\left(\frac{1}{3} \leq X \leq \frac{1}{2}\right)$ (iii) $P\left(X \leq \frac{1}{2} \,\middle\|\, \frac{1}{3} \leq X \leq \frac{2}{3}\right)$ | 10 |