*R20 Regulation* *Subject code: 3H4GA*

# TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

## B.Tech IV Semester Supplementary Examinations, July 2024

## PROBABILITY & ALGEBRA

**(Common to CSE(AI&ML) & CSE(DS))**

***Maximum Marks: 70*** Date:18.07.2024 Duration: 3 hours

Note: 1.This question paper contains two parts A and B.
2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit which carries 10M.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

| | **All the following questions carry equal marks (10X2M=20 Marks)** | **CO** | **Bloom Tx** |
|---|---|---|---|
| 1 | Prove that $P(A \cap B') = P(A) - P(A \cap B)$ | 1 | L1 |
| 2 | Define conditional probability . | 1 | L1 |
| 3 | Define Marginal probability functions of random variables X and Y | 2 | L1 |
| 4 | If f(x) = k(2x + 3) in 0<x<2, then find k? | 2 | L1 |
| 5 | The mean and variance of a binomial distribution are 6 & 3 respectively find the value of q. | 3 | L1 |
| 6 | If X is a possion variate such that P(X = 0) = [P(X = 2) + 3 P(X = 4) ]then find $P(X \leq 2)$ | 3 | L1 |
| 7 | Let R= { [1,1] [2,2] [3,3] [4,4] [5,5] [1,2] [2,1] [5,4] [4,5]} be the equivalence relation on A = {1,2,3,4,5} Find equivalence classes of R. | 4 | L1 |
| 8 | Find the inverse of the function f(x) = $e^x$ defined from R to $R^+$ | 4 | L1 |
| 9 | Show that binary operation * defined on (R,*) where $x*y=x^y$ is not associative | 5 | L1 |
| 10 | Define Normal subgroup of a group with an example. | 5 | L1 |

Part-B

| | Answer All the following questions **(5X10M=50Marks)** | | |
|---|---|---|---|
| 11 | The machines A, B, C produce 40%, 30%, 30% of the total number of items of factory. The percentage of defective items of these machines are 4%, 2%, 3%. If an item is selected at random and is found to be defective find the probability that it is produced from machine B. (10M) | 1 | L2 |
| | OR | | |
| 12 | In a factory, machine A produces 40% of the total output and machine B produces 60%. On the average 9 items in 1000 produced by A are defective and 1 item in 250 produced by B is defective. An item is drawn at random from a day's output is defective, what is the probability that it was produced by A? (10M) | 1 | L2 |

<table>
<tr><td>13</td><td>Given joint density function $f(x,y) = \begin{cases} 2 & 0<x<1, 0<y<1 \\ 0 & \textit{other wise} \end{cases}$<br>Find Marginal density function of x & y. (10M)</td><td>2</td><td>L2</td></tr>
<tr><td></td><td>OR</td><td></td><td></td></tr>
<tr><td>14</td><td>A random variable ‘x’ has the following probability function<br><table><tr><td>x</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr><tr><td>P(x)</td><td>0</td><td>k</td><td>2k</td><td>2k</td><td>3k</td><td>$K^2$</td><td>$2k^2$</td><td>$7k^2+k$</td></tr></table>i) Find the value of ‘k’ ii) Mean (5+5)M</td><td>2</td><td>L2</td></tr>
<tr><td>15</td><td>1000 students has written an examination the mean is 35 and standard deviation is 5. Assuming the distribution to be normal find<br>(i) How many students marks lie between 25 and 40.<br>(ii) How many get more than 40<br>(iii) How many students get below 20<br>(iv) How many get more than 50<br>(v) How many students marks lie between 30 and 40 (10M)</td><td>3</td><td>L2</td></tr>
<tr><td></td><td>OR</td><td></td><td></td></tr>
<tr><td>16</td><td>Show that mean and variance of Poission distribution are same. (10M)</td><td>3</td><td>L2</td></tr>
<tr><td>17</td><td>a) Draw the Hasse diagram representing the positive divisors of 45. (5M)<br>b) If R denotes a relation on the set of all ordered pairs of positive integers by (a,b)R(c,d) iff ad=bc show that ‘R’ is an equivalence relation. (5M)</td><td>4</td><td>L2</td></tr>
<tr><td></td><td>OR</td><td></td><td></td></tr>
<tr><td>18</td><td>a) Let X= {1,2,3,4,5,} and relation R={(x,y)/x>y}.Find its matrix. (5M)<br>b) What is Compatibility relation and Write the procedure to find compatibility blocks. (5M)</td><td>4</td><td>L2</td></tr>
<tr><td>19</td><td>Show that $Q_1$ (rational numbers other than1) is an infinite abelian group with respect to ‘0’ defined by a0b=a+b-ab, where a,b are rational numbers. (10M)</td><td>5</td><td>L2</td></tr>
<tr><td></td><td>OR</td><td></td><td></td></tr>
<tr><td>20</td><td>Define abelian group. Prove that G ={0,1,2,3,4} is an abelian group of order 5 with respect to addition modulo 5. (10M)</td><td>5</td><td>L2</td></tr>
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