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MECHANICAL ENGINEERING

UNITWISE QUESTION BANK

Course Title : Probability, Statistics and Complex Variables

Course Code : 25MA302

Regulation : NR25

UNIT - I: Random Variables and Probability Distributions

S.No	Questions	BT	CO	PO								
Part – A (Short Answer Questions)												
1	Define conditional probability.	L1	CO1	PO1								
2	Define pairwise independent events.	L1	CO1	PO3								
3	Suppose a continuous random variable X has a probability density function $f(x)=k(1-x^2)$ for $0<x<1$ and $f(x)=0$ otherwise, then find k.	L3	CO1	PO1								
4	For the following probability distribution find $E(x),E(x^2), E[(2x+1)^2]$  <table border="1"><tr><td>X</td><td>-3</td><td>6</td><td>9</td></tr><tr><td>P(x)</td><td>1/6</td><td>½</td><td>1/3</td></tr></table>	X	-3	6	9	P(x)	1/6	½	1/3	L3	CO1	PO2
X	-3	6	9									
P(x)	1/6	½	1/3									
5	Write the relation between raw and central moments.	L1	CO1	PO2								
6	An integer is chosen at random from the first 200 positive integers. What is the probability that the integer chosen is divisible by 6 or by 8	L3	CO1	PO1								
7	A bag contains 3 white and 5 black balls. If a ball is drawn at random find the probability for it to be black.	L3	CO1	PO1								
8	Write the formulas of skewness and kurtosis in terms of moments.	L1	CO1	PO1								
9	A bag contains 50 tickets numbered 1,2, 3,...50. Of which 5 are drawn at random and arranged in ascending order of the magnitude. What is the probability that the middle one is 30?	L2,L3	CO1	PO2								
10	In a single throw with two dice find the probability of throwing a sum 10.	L3	CO1	PO2								

Part – B (Long Answer Questions)																							
11	a)	State and prove Bayes theorem.	L1	CO1	P01																		
	b)	Of the three men, the chances that a politician, a businessman or an academician will be appointed as a vice-chancellor (V.C) of a university are 0.5,0.3,0.2 respectively. Probability that research is promoted by these persons if they are appointed as V.C are 0.3,0.7,0.8 respectively. i) Determine the probability that research is promoted. If the research is promoted what is the probability that V.C is ii) academician? iii) Business man iv) Politician	L1,L3	CO1	P02																		
12		A random variable X has the following probability function. (10m) <table border="1"> <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=x)</td> <td>0</td> <td>k</td> <td>2k</td> <td>2k</td> <td>3k</td> <td>K²</td> <td>2 K²</td> <td>7 K²+k</td> </tr> </table> Determine: i. K ii. Evaluate P(X<6), P(X≥6), P(0<X<5) iii. If P(X≤K)> ½, find the minimum value of k iv. Determine the distribution function of X v. Mean vi. Variance	X	0	1	2	3	4	5	6	7	P(X=x)	0	k	2k	2k	3k	K ²	2 K ²	7 K ² +k	L3,L4	CO1	PO3
X	0	1	2	3	4	5	6	7															
P(X=x)	0	k	2k	2k	3k	K ²	2 K ²	7 K ² +k															
13		The probability density f(x) of a continuous random variable is given by $f(x) = ce^{- x }, -\infty < x, \infty$ Show that c=1/2 and i. Find that the mean and variance of the distribution. ii. Find the probability that the variate lies between 0 and 4. iii. Find the probability that x>6.	L3,L4	CO1	PO3																		
14	a)	In a certain town 40% have brown hair, 25% have brown eyes and 15% have both brown hair and brown eyes, a person is selected at random from the town. i. If he has brown hair, what is the probability that he has brown eyes also? ii. If he has brown eyes, determine the probability that he does not have brown hair?	L3,L4	CO1	PO3																		

	b)	From a city 3 newspapers A, B, C are being published. A is read by 20%, B is read by 16%, C is read by 14%, both A and B are read by 8%, both A and C are read by 5%, both B and C are read by 4% and all three A, B, C are read by 2%. What is the percentage of the population that read at least one paper?		CO1													
15	a)	Two aero planes bomb a target in succession. The probability of each correctly scoring a hit is 0.3 and 0.2 respectively. The second will bomb only if the first misses the target. Find the probability that i. Target is hit ii. Both fails to score hits	L2,L4	CO1	PO1												
	b)	A sample of 4 items is selected at random from a box containing 12 items of which 5 are defective. Find the expected number E of defective items.	L2,L4,L5	CO1	PO2												
16		Calculate the first four moments of the following about the arbitrary origin. Also find the moments about the mean. <table border="1"> <tr> <td>Class interval</td><td>60-62</td><td>63-65</td><td>66-68</td><td>69-71</td><td>72-74</td></tr> <tr> <td>Frequency</td><td>5</td><td>18</td><td>42</td><td>27</td><td>8</td></tr> </table>	Class interval	60-62	63-65	66-68	69-71	72-74	Frequency	5	18	42	27	8	L3,L5	C01	PO1
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