CONTINUOUS INTERNAL EVALUATION-1

Dept: BS (MAT)	Sem/Div: IV/ A & B	Sub: Engineering Statistics & Linear Algebra	S Code: 18EC44
Date: 25-05-2021	Time: 3:00 PM – 4:30PM	Max. Marks: 50	Elective: N

Note: Answer any two full questions, choosing one full question from each part.

PART-A

Q. 1 a (Marks: 8, RBT: L2, COs: CO1)

Given

y_k	2.1	3.2	4.8	5.4	6.9
$P(y_k)$	0.2	0.21	0.19	0.14	0.26

(a) Find the mean and variance of Y

(b) If $X = Y^2 + 1$ what are mean and variance of X

Q. 1 b (Marks: 8, RBT: L3, COs: CO1)

Define Binomial distribution. Obtain the characteristic function of a binomial random variable and using the characteristic function derive its mean and variance

Q. 1 c (Marks: 9, RBT: L1, COs: CO4)

Let V be the set of all pairs (x, y) of real numbers and F be a field of real numbers. Examine in each of the following cases whether V is a Vector Space over the field of real numbers or not?

(i) $(x, y) + (x_1, y_1) = (x + x_1,\ y + y_1)$
$c(x, y) = (|c|x, |c|y)$

(ii) $(x, y) + (x_1, y_1) = (x + x_1,\ y + y_1)$
$c(x, y) = (0, cy)$

(iii) $(x, y) + (x_1, y_1) = (x + x_1,\ y + y_1)$
$c(x, y) = (c^2x,\ c^2y)$

OR

Q. 2 a (Marks: 8, RBT: L2, COs: CO1)

The following is the PDF for the random variable U

$$f_U(u) = \begin{cases} c \exp\left(-\frac{u}{2}\right) & \text{for } 0 \le u < 1 \\ 0 & \text{otherwise} \end{cases}$$

. Find the value that c must have and evaluate $F_U(0.5)$

Q. 2 b (Marks: 8, RBT: L1, COs: CO1)

The random variable X has the following distribution as show in the table. Determine (a) k (b) mean (c) variance of X

x	-2	-1	0	1	2	3
P(x)	0.1	k	0.2	2k	0.3	k

Q. 2 c (Marks: 9, RBT: L1, COs: CO4)

(a) Define vector space over the field of scalars.

(b) Show that the set of all real symmetric matrices of order ‘n’ is a vector space over the field of real numbers with respect to matrix addition and multiplication of a matrix by a scalar, ‘n’ being fixed integer.

Prepared by: M Ramananda Kamath

HOD: M Ramananda Kamath

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		PART-B			
3	a	Let X is a random variable and $F_X(x)$ is the distribution function of X. (i) Show that $P(a < X \leq b) = F_X(b) - F_X(a)$ (ii) If Y is a random variable such that $Y = aX + b$ Show that $E[Y] = a\,E(X) + b$ and $var[Y] = a^2\,var[X]$	8	L2	CO1
	b	Given the discrete random variable X with $f_X(x) = 0.37\delta(x) + 0.16\,\delta(x-1) + 0.29\,\delta(x-2) + 0.18\delta(x-3)$ and the event $B = \{X > 1\}$ Find the PDF and CDF conditioned by the event B.	8	L2	CO1
	c	(a) Define a field (b) A scalar multiplication in V is defined as $a.x = x^a$, where $a \in R$ $x \in V$. Show that the following conditions hold in V. (i) $(a+b).x = x^{a+b}$ (ii) $a.(x_1 \times x_2) = (x_1 \times x_2)^a$ (iii) $a \cdot (b.x) = (ab) \cdot x$ (iv) $1.x = x$, where $1 \in R$	9	L1	CO4
		OR			
4	a	The random variable X has the expectation $\mu_X = 37.9$ and S.D $\sigma_X = 10.3$. The random variable Y is obtained from X using $Y = 0.6X^2 + 7.9X + 107.1$. Find (a) $E[X^2]$ (b) mean of Y	8	L1	CO1
	b	If the probability of producing a defective screw is 0.01 what is the probability that a lot of 100 screws will contain (i) more than 2 defective screws (ii) atmost 4 defective screws	8	L2	CO1
	c	Verify whether or not $\mathbb{R}^n = \{(a_1, a_2, \ldots, a_n) / a_1, a_2, ---, a_n \in \mathbb{R}\}$ the set of all n-tuples of real numbers forms a vector space over the field of real numbers with point wise addition and scalar multiplication defined as follows: $(a_1, a_2, \ldots, a_n) + (b_1, b_2, \ldots, b_n) = (a_1 + b_1,\ a_2 + b_2, \ldots, a_n + b_n)$ and $c\,(a_1, a_2, \ldots, a_n) = (ca_1, ca_2, \ldots, ca_n)$ for all $a_1, a_2, \ldots, a_n, b_1, b_2, \ldots, b_n, c \in \mathbb{R}$	9	L1	CO4

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