Subject : Mathematics-III
Branch : CT/IT
Max. Marks : 35

Semester : III Sem
Date of Exam : 03/11/2023
Time : 1 hr. 30 min.

S. No.	Questions	Marks	CO	BL
1 a)	(i) If $A=\begin{bmatrix}1 & 0\\0 & 3\end{bmatrix}$, then what is A^{200} ? (a) $\begin{bmatrix}3 & 0\\0 & 1\end{bmatrix}$ (b) $\begin{bmatrix}1 & 0\\0 & 3^{200}\end{bmatrix}$ (c) $\begin{bmatrix}3^{200} & 0\\0 & 1\end{bmatrix}$ (d) $\begin{bmatrix}1 & 0\\0 & 3^{100}\end{bmatrix}$	1	3	3
	(ii) What is the maximum Rank of 2 x 3 matrix ? (a) 0 (b) 3 (c) 1 (d) 2	1	3	3
1 b)	Use Sylvesters's theorem to show that $\sin^2 A+\cos^2 A=I$ where $A=\begin{bmatrix}1 & 2\\-1 & 4\end{bmatrix}$	5	3	3
	OR			
2 a)	(i) The lowest eigen value of 2*2 matrix $\begin{bmatrix}4 & 2\\1 & 3\end{bmatrix}$ is (a) 1 (b) 2 (c) 3 (d) 5	1	3	3
	(ii) Eigen Values of the matrix are $\begin{bmatrix}\cos x & -\sin x\\\sin x & \cos x\end{bmatrix}$ (a) $\pm\cos x$ (b) $\pm\sin x$ (c) $\cos x\pm\sin x$ (d) $\pm\tan x$	1	3	3
2 b)	Find largest eigen value and corresponding eigen vector for the matrix $\begin{bmatrix}4 & 1\\1 & 3\end{bmatrix}$	5	3	3
3 a)	(i) If f(x)=1/10, x=10 then E(X)is, (a) 0 (b) 6/8 (c) 1 (d) -1	1	4	3
	(ii) What moment generating function $X=\begin{cases}1/2, & \text{prob. } 1/2\\-1/2, & \text{prob. } 1/2\end{cases}$ (a) $(e^{-t}-e^t)/2$ (b) $2/(e^{t/2}+e^{-t/2})$ (c) $(e^{t/2}+e^{-t/2})/2$ (d) $(e^{t/2}-e^{-t/2})/2$	1	4	3
3 b)	Out of 800 families with 5 children each. How many would you expect to have (i) 3 boys (ii) 5 girls (iii) either 2 or 3 boys. Assume equal probabilities for boys and girls.	5	4	3
3 c)	A random variable X is defined by $X=\begin{cases}-2, & \text{prob. } 1/3\\3, & \text{prob. } 1/2\\1, & \text{prob. } 1/6\end{cases}$ Find i) E(X), ii) E(2X+3), iii) E(X²), iv) E(X² +5X) v) Var(X) (vi) σₓ	7	4	3

4 a)	**OR**			
	(i) The probability density function f(x) cannot exceed: (a) 0.5 (b) 1 (c) 0 (d) Mean	1	4	2
	(ii) If $n = 1$ and $p = 1/6$, then λ is (a) 5/6 (b) 5/36 (c) 1/6 (d) 4/6	1	4	3
4 b)	Suppose that the customers arriving at ticket counter according to poisson process with a mean rate of 2 per minutes. Then in arrival of 5 minutes find the probability that the number of customers is (i) exactly 5 (ii) less than 4 (iii) greater than 3.	5	4	3
4 c)	Find moment generating function and first four moments about origin for random variable X given by $$X = \begin{cases} 1, & \text{prob. } 1/2 \\ -1, & \text{prob. } 1/2 \end{cases}$$	7	4	3
5 a)	(i) The value of correlation coefficient always lies between (a) -1 to 1 (b) 0 to 1 (c) -1 to 0 (d) 0.5 to 1	1	5	2
	(ii) Multiple linear regression equation of X_2 on X_1 and X_3 is..... (a) $X_1 = a + bX_2 + cX_3$ (b) $X_3 = a + bX_1 + cX_2$ (c) $X_2 = aX_1 + bX_2 + cX_3$ (d) $X_2 = a + bX_1 + cX_3$	1	5	2
5 b)	In a distribution of three variables it is observed that $r_{12} = 0.70$, $r_{13} = 0.61$, $r_{23} = 0.40$. Calculate the value of $r_{12.3}$, $r_{13.2}$ and $r_{23.1}$.	5	5	3
5 c)	Find the multiple linear regression equation of X_1 on X_2 and X_3 from the data relating to three variables given below:	7	5	3

X_1	4	6	7	9	13	15
X2	15	12	8	6	4	3
X_3	30	24	20	14	10	4

6 a)	**OR**			
	(i) The mode of the data 0, 1, 6, 7, 2, 3, 7, 6, 6, 2, 6, 0, 5, 6, 0 is (a) 0 (b) 7 (c) 2 (d) 6	1	5	1
	(ii) The value of the variables which divides the distribution into two equal parts is called.... (a) Mean (b) Mode (c) Median (d) Standard deviation	1	5	1
6 b)	Find the mode from the following data	5	5	3

Age	0 - 6	6 - 12	12 - 18	18 -24	24 - 30	30 - 36	36 - 42
frequency	6	11	25	35	18	12	6

6 c)	Calculate the mean deviation and standard deviation for the following data	7	5	3

Size of item	6	7	8	9	10	11	12
frequency	3	6	9	13	8	5	4