RV Educational Institutions ®
RV College of Engineering ®
Autonomous Institution Affiliated to Visvesvaraya Technological University, Belagavi
Approved by AICTE, New Delhi

<table>
<tr><th>Q.No</th><th>Solutions</th><th>Marks</th></tr>
<tr><td>1.</td><td>
i) $\begin{bmatrix}1\\1\end{bmatrix}, \begin{bmatrix}2\\4\end{bmatrix} \in S_1$ but $\begin{bmatrix}1\\1\end{bmatrix} + \begin{bmatrix}2\\4\end{bmatrix} = \begin{bmatrix}3\\5\end{bmatrix} \notin S_1$(or any other suitable justification), Not a subspace.
ii) Justification. Subspace.
iii) Justification. Subspace.
iv) Justification. Not a subspace.
v) Justification. Not a subspace.
</td><td>1+1
2+2
2+2</td></tr>
<tr><td>2.a</td><td>
$t = c_1u + c_2v + c_3w;\ 2 = c_1 + 2c_2 + 2c_3,\ 5 = 3c_1 - 2c_2 - c_3,\ -4 = 2c_1 - 5c_2 + 3c_3,\ 0 = c_1 + 4c_2 + 6c_3$
$\begin{bmatrix}1 & 2 & 2\\3 & -2 & -1\\2 & -5 & 3\\1 & 4 & 6\end{bmatrix}\begin{bmatrix}c_1\\c_2\\c_3\end{bmatrix} = \begin{bmatrix}2\\5\\-4\\0\end{bmatrix}$ this system reduces to $\begin{bmatrix}1 & 2 & 2\\0 & 1 & -6\\0 & 0 & 1\\0 & 0 & 0\end{bmatrix}\begin{bmatrix}c_1\\c_2\\c_3\end{bmatrix} = \begin{bmatrix}2\\7\\-1\\0\end{bmatrix}$
$c_3 = -1\ c_2 = 1$ and $c_1 = 2$
$t = 2u + 1v - 1w$
</td><td>1+2
1
1</td></tr>
<tr><td>2.b</td><td>
Suppose $c_1(1 + x - 2x^2) + c_2(2 + 5x - x^2) + c_3(x + x^2) = 0$
$c_1 + 2c_2 = 0,\ c_1 + 5c_2 + c_3 = 0,\ -2c_1 - c_2 + c_3 = 0$
$\begin{bmatrix}1 & 2 & 0\\1 & 5 & 1\\-2 & -1 & 1\end{bmatrix}\begin{bmatrix}c_1\\c_2\\c_3\end{bmatrix} = \begin{bmatrix}0\\0\\0\end{bmatrix}$ $\det\begin{bmatrix}1 & 2 & 0\\1 & 5 & 1\\-2 & -1 & 1\end{bmatrix} = 0$
Therefore, the above homogeneous system has non-trivial solution.
Hence, the given set of polynomials is a linearly dependent set in P_2
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<tr><td>3.a</td><td>
i) $12k^2 + 9k = 1 \Rightarrow k = 0.0982$
ii) $P(X \geq 5) = 0.214,\ \ P(X < 3) = 0.2946,\ \ P(2 < X \leq 5) = 0.51993$
ii) $E[X] = 3.6789$
</td><td>2
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<tr><td>3.b</td><td>
$X = \{0, 1, 2, 3\}$
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<tr><td>4.a</td><td>
i) $P(X < 1.2) = \int_0^1 x dx + \int_1^{1.2} (2 - x)dx = 0.68$
ii) $P(0.5 < X < 1) = \int_{0.5}^1 x\, dx = 0.375$
</td><td>3
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<tr><td>4.b</td><td>
Probability mass function $= \frac{d(F(x))}{dx} = 8e^{-8x}$
$P(X < 12) = 1 - e^{-1.6}$
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i) Marginal distribution of X and Y
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ii) $P(X > 1, Y \geq 3) = 0.75,\ \ P(X < 3, Y = 3) = 0.15.$
iii) $Cov(X, Y) = E[XY] - E[X]E[Y] = 7.85 - 2.45 \times 3.2 = 0.01.$
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Let $X = \{x\ |x = a + b < 5, (a, b) \in \Omega\} = \{2, 3, 4\},\ \ Y = \{y \mid y = \max(a, b)\} = \{1, 2, 3, 4\}$
Joint probability distribution $p(x, y)$
$P(X = 2, Y = 1) = P((1,1)) = 1/16$
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DEPARTMENT OF MATHEMATICS

Course: Linear Algebra and Probability Theory	**CIE-I**	**Maximum marks: 50**
Course code: MAT231CT	**Third semester 2023-2024** **Branch: CS, CD, CY**	**Time: 10:00AM-11:30AM** **Date: 08-01-2024**

SCHEME AND SOLUTION

<table>
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DEPARTMENT OF MATHEMATICS

Course: Linear Algebra and Probability Theory	**CIE-II**	**Maximum marks: 50**
Course code: MAT231TC	**Third semester 2023-2024** **Branch: CS, CD, CY**	**Time: 10:00AM-11:30AM** **Date: 20-02-2024**

Instructions to candidates: *Answer all questions.*

Q.No.	QUESTIONS	M	BT	CO
1	Determine bases and dimension for row space, column space and null space of the matrix, $A = \begin{bmatrix} -3 & 6 & -1 & 1 & -7 \\ 1 & -2 & 2 & 3 & -1 \\ 2 & -4 & 5 & 8 & -4 \end{bmatrix}$.	10	1	1
2.a	Consider a triangle with vertices $(0,0), (1,1)$ and $(1,-1)$. Determine the matrix representation of the linear transformation that i) Shrinks the triangle by a factor 0.5 ii) Reflects the triangle about $y-$ axis iii) Rotates the triangle by 90°. Represent each transformation geometrically.	6	3	3
2.b	Verify whether the given transformation $T: \mathbb{R}^3 \to \mathbb{R}^3$ is linear. $T(x,y,z) = (2x+y,\ 2y-z,\ 2x-y+z)$.	4	2	2
3	Obtain the orthogonal projection of the vector $(1,1,-1,-1)^T$ onto the column space of the matrix $A = \begin{bmatrix} 1 & 6 & 6 \\ 3 & -8 & 3 \\ 1 & -2 & 6 \\ 1 & -4 & -3 \end{bmatrix}$. Given that the columns of A are linearly independent.	10	2	2
4.a	Suppose that the error in the reaction temperature, in ˚C, and pressure, in kPa, for a controlled laboratory experiment are modelled as continuous random variables X and Y, respectively, having the joint density function, $f(x,y) = \begin{cases} c(x^2+y^2), & 0 \le x \le 1, \quad 0 \le y \le 1; \\ 0, & \text{otherwise.} \end{cases}$ Determine: (i) The constant c (ii) The marginal density functions of X and Y (iii) $P(X+Y \le 1)$.	6	2	2
4.b	Suppose that airplane engines operate independently and fail with probability equal to 0.4. Assume that a plane makes a safe flight if at least one-half of its engines run, determine whether a 4-engine plane or a 2-engine plane has the higher probability for a successful flight.	4	2	2
5.a	At a certain corporate company, the arrival of messages in the complaint inbox can be modelled as a Poisson process. Assume that on the average there are 10 messages per hour. i. Determine the probability that there are more than one, but less than 10 messages arrive within a span of two hours. ii. If no messages arrive in the first 30 min, determine the probability that no messages will arrive in the next 10 min. iii. Determine the interval of time such that the probability that no messages arrive in the interval is 0.8.	6	3	3
5.b	The compressive strength of samples of cement can be modelled by a normal distribution with a mean of 6000 kilograms per square centimetre and a standard deviation of 100 kilograms per square centimetre. i. Determine the probability that a sample's strength is between 5800 and 5900 kg/cm^2 ii. Find out the strength that is exceeded by 95% of the samples	4	2	2

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DEPARTMENT OF MATHEMATICS

Course: Linear Algebra and Probability Theory	**Improvement Test**	**Maximum marks: 50**
Course code: MA231TC	**Third semester 2023-2024** **Branch: CS, CD, CY**	**Time: 10:00AM-11:30AM** **Date: 19-03-2024**

Instructions to candidates: *Answer all questions.*

Q.No.	QUESTIONS	M	BT	CO
1	Obtain the singular value decomposition of the matrix $\begin{bmatrix} -3 & 6 & 6 \\ 1 & -2 & -2 \end{bmatrix}$.	10	3	4
2.	Obtain the QR-factorization of the matrix $\begin{bmatrix} 1 & 3 & 2 \\ -1 & 1 & 0 \\ 0 & 2 & 1 \\ 1 & 1 & 4 \end{bmatrix}$.	10	3	3
3.a	Find the projection of the vector $\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$ on to the space $W = \text{span}\left\{\begin{bmatrix} 1 \\ -1 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 \\ 8 \\ 7 \end{bmatrix}\right\}$. Interpret the answer.	4	2	2
3.b	The lifetime of a mechanical assembly in a vibration test is exponentially distributed with a mean of 400 hours. i) Determine the probability that an assembly operates for more than 500 hours before failure. ii) If an assembly has been on test for 400 hours without a failure, obtain the probability of a failure in the next 100 hours. iii) If 10 assemblies are tested, find the probability that at least one fails in less than 100 hours. Assume that the assemblies fail independently.	6	3	3
4.a	A lawyer commutes daily from his suburban home to his midtown office. The average time for a one-way trip is 24 minutes, with a standard deviation of 3.8 minutes. Assume the distribution of trip times to be normally distributed. i) If the office opens at 9:00 A.M. and the lawyer leaves his house at 8:45 A.M. daily, determine the percentage of the time he is late for work. ii) Find the length of time above which we find the slowest 15% of the trips.	5	2	2
4.b	The amount of time that a drive-through bank teller spends on a customer is a random variable with a mean $\mu = 3.2$ minutes and a standard deviation $\sigma = 1.6$ minutes. If a random sample of 64 customers is observed, find the probability that their mean time at the teller's window is i) More than 3.5 minutes; ii) At least 3.2 minutes but less than 3.4 minutes.	5	1	1
5.a	According to a recent study, 17.5% of the adult population of Canada are smokers. Suppose a random sample of 200 adult Canadians is taken. Determine i) The mean and standard deviation of the sample proportion. ii) The probability that more than 20% of the adults in the sample are smokers. iii) The probability that between 34 and 44 of the adults in the sample are smokers.	6	2	2
5.b	Electric CFL manufactured by company A have mean lifetime of 2400 hours with standard deviation 200 hours, while CFL manufactured by company B have mean lifetime of 2200 hours with standard deviation of 100 hours. If random samples of 125 electric CFL of each company are tested, find i) The mean and standard error of the sampling distribution of the difference of mean lifetime of electric CFLs. ii) The probability that the CFLs of company A will have a mean lifetime at least 160 hours more than the mean lifetime of the CFLs of company B.	4	2	2

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DEPARTMENT OF MATHEMATICS

Course: Linear Algebra and Probability Theory	**Improvement Test**	**Maximum marks: 50**
Course code: MA231TC	**Third semester 2023-2024** **Branch: CS, CD, CY, IS**	**Time: 10:00AM-11:30AM** **Date: 20-03-2024**

SCHEME AND SOLUTION

Q.No	Solutions	Marks
1.	$AA^T=\begin{bmatrix}81&-27\\-27&9\end{bmatrix}$, Eigenvalues of AA^T are 90 and 0 $A^TA=\begin{bmatrix}10&-20&-20\\-20&40&40\\-20&40&40\end{bmatrix}$ Eigenvalues of A^TA are 90, 0 and 0 Eigenvector of AA^T for 90 is $[-3\quad 1]^T$ and for 0 is $[1\quad 3]^T$ Eigenvector of A^TA for 90 is $[-1\quad 2\quad 2]^T$ and for 0 is $c_1[2\quad 1\quad 0]^T+c_2[2\quad 0\quad 1]^T$ Orthogonal eigenvectors of A^TA are $[-1\quad 2\quad 2]^T$, $[2\quad 1\quad 0]^T$ and $[-2\quad 4\quad -5]^T$ $U=\begin{bmatrix}-3/\sqrt{10}&1/\sqrt{10}\\1/\sqrt{10}&3/\sqrt{10}\end{bmatrix}\Sigma=\begin{bmatrix}\sqrt{90}&0&0\\0&0&0\end{bmatrix}, V=\begin{bmatrix}-1/3&2/\sqrt{5}&-2/3\sqrt{5}\\2/3&1/\sqrt{5}&4/3\sqrt{5}\\2/3&0&-\sqrt{5}/3\end{bmatrix}$	1+1 1+1 1+1 1+1 1 1
2.	$v_1=[1\quad -1\quad 0\quad 1]^T, v_2=[3\quad 1\quad 2\quad 1]^T, v_3=[2\quad 0\quad 1\quad 4]^T$ $u_1=v_1, u_2=v_2-\frac{(u_1\cdot v_2)}{u_1\cdot u_1}u_1=[2\quad 2\quad 2\quad 0]^T$ $u_3=v_3-\frac{(u_1\cdot v_3)}{u_1\cdot u_1}u_1-\frac{(u_2\cdot v_3)}{u_2\cdot u_2}u_3=[-1\quad 1\quad 0\quad 2]^T$ $Q=\begin{bmatrix}1/\sqrt{3}&1/\sqrt{3}&-1/\sqrt{6}\\-1/\sqrt{3}&1/\sqrt{3}&1/\sqrt{6}\\0&1/\sqrt{3}&0\\1/\sqrt{3}&0&2/\sqrt{6}\end{bmatrix}, R=Q^TA=\begin{bmatrix}\sqrt{3}&\sqrt{3}&2\sqrt{3}\\0&2\sqrt{3}&\sqrt{3}\\0&0&\sqrt{6}\end{bmatrix}$	1+2 3 2+2
3.a	Let $u=[1\quad 2\quad 3]^T, v_1=[1\quad -1\quad 1]^T, v_2=[1\quad 8\quad 7]^T$ $\vec{p}=\frac{u\cdot v_1}{v_1\cdot v_1}v_1+\frac{u\cdot v_2}{v_2\cdot v_2}v_2=\frac{2}{3}\begin{bmatrix}1\\-1\\1\end{bmatrix}+\frac{1}{3}\begin{bmatrix}1\\8\\7\end{bmatrix}=\begin{bmatrix}1\\2\\3\end{bmatrix}$, $[1\quad 2\quad 3]^T$ is in W	2+1 1
3.b	Given $\mu=400hr\Rightarrow\lambda=1/400$. i) $P(X>500)=e^{-\lambda 500}=e^{-500/400}=0.2865$ ii) $P(X<500\mid X>400)=P(X<100)=1-e^{-\lambda 100}=1-e^{-\frac{100}{400}}=0.2212$ iii) Required probability $=\sum_{x=1}^{10}b(x;p.n)=1-b(0;p,n)=1-(1-p)^{10}=1-e^{-\frac{10}{4}}=0.9179$	2 2 2
4.a	Given $\mu=24min$ and $\sigma=3.8min$ i) $P(X>15)=P(Z>-2.37)=1-\phi(-2.37)=0.9911$ ii) $P(X>x)=0.15\Rightarrow P\left(Z>\frac{x-24}{3.8}\right)=0.15\Rightarrow P\left(Z<\frac{x-24}{3.8}\right)=0.85\Rightarrow\frac{x-24}{3.8}=1.04$ or $x=$ 27.952min	2 3
4.b	Given $\mu=3.2min,\ \sigma=1.6min,\ n=64$. Therefore, $\mu_{\bar{X}}=\mu=3.2min,\ \sigma_{\bar{X}}=\frac{\sigma}{\sqrt{n}}=0.2$. i) $P(\bar{X}>3.5)=P\left(Z>\frac{3.5-\mu_{\bar{X}}}{\sigma_{\bar{X}}}\right)=P(Z>1.5)=1-\phi(1.5)=0.0668$	1 2 2

	ii) $P(3.2 < \bar{X} < 3.4) = P(0 < Z < 1) = \phi(1) - 0.5 = 0.3413$	
5.a	Given $p = 0.175,\ n = 200.$ i) $\mu_{\hat{P}} = p = 0.175,\ \sigma_{\hat{P}} = \sqrt{\frac{p(1-p)}{n}} = 0.02687$ ii) $P(\hat{P} > 0.2) = P\left(Z > \frac{0.2-0.175}{0.02687}\right) = P(Z > 0.93) = 1 - \phi(0.93) = 0.1761$ iii) $P\left(\frac{34}{200} < X < \frac{44}{200}\right) = P(-0.186 < Z < 1.67) = 0.95254 - 0.424655 = 0.527885$	2 2 2
5.b	Population 1: $\mu_1 = 2400,\ \sigma_1 = 200,\ n_1 = 125$ Population 2: $\mu_2 = 2200,\ \sigma_2 = 100,\ n_2 = 125$ i) $\mu_{\bar{X}_1-\bar{X}_2} = \mu_1 - \mu_2 = 200$ and $\sigma_{\bar{X}_1-\bar{X}_2} = \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}} = 20.$ ii) $P(\bar{X}_1 - \bar{X}_2 > 160) = P\left(Z > \frac{160-200}{20}\right) = 1 - \phi(-2) = 0.97725.$	2 2

DEPARTMENT OF MATHEMATICS

Course: Linear Algebra and Probability Theory	**Quiz-II**	**Maximum marks: 10**
Course code: MA231TC	**Third semester 2023-2024** **Branch: CS, CD, CY**	**Time: 11:45AM-12:15PM** **Date: 20-02-2024**

Name:	**Branch:**	**USN:**

***Instructions to students**: Rough work can be done at the backside of the sheet.*

Sl. No.	Questions	M	BTL	CO
1	4% of the switches manufactured by a firm are found to be defective. Using Poisson distribution, the probability that a box containing 150 switches contain 2 or more defective switches is _________. **Ans: 0.9826**	1	2	2
2	A large chain retailer purchases a certain kind of electronic device from a manufacturer. The manufacturer indicates that the defective rate of the device is 3%. The inspector randomly picks 20 items from a shipment. Using binomial distribution, the probability that there will be at least one defective item among these 20 is _________. **Ans: 0.4562**	1	2	2
3	A survey indicates that people use their cellular phones an average of 1.5 years before buying a new one. The standard deviation is 0.25 year. Suppose a cellular phone user is selected at random assumes a normal random variable. The probability that the user will use their current phone for less than 1 year before buying a new one is _______. **Ans:0.0228**	2	2	2
4	If $h(x,y) = \begin{cases} kxy^2, 0 < x < 2,\ 0 < y < 1 \\ 0, \quad\quad otherwise \end{cases}$ is a joint probability density function, then the constant k is ______. **Ans: $\boldsymbol{k = 1.5}$**	1	1	1
5	Let $T: \mathbb{R}^2 \to \mathbb{R}^2$ be a linear transformation and $T(1,0) = (1,-1)$ and $T(0,1) = (0,2)$. Then the image of $(3,1)$ is _______ and the preimage of $(0,4)$ is _______. **Ans: $\boldsymbol{T(3,1) = (3,-1)}$ and preimage of $\boldsymbol{(0,4) = (0,2)}$**	2	2	2
6	The Rotation matrix through an angle of 60° in anticlockwise direction is ______________. **Ans:** $\begin{bmatrix} \mathbf{1/2} & \mathbf{-\sqrt{3}/2} \\ \mathbf{\sqrt{3}/2} & \mathbf{1/2} \end{bmatrix}$	1	1	2
7	The projection of the vector $(1,2,3)^T$ onto the vector $(1,1,1)^T$ is _______________. **Ans: $\boldsymbol{(2,2,2)^T}$**	1	1	2
8	The nullity of a 5×3 matrix (Tick the correct option) (i) **Can be any number from zero to three**. (ii) Must be two. (iii) Can be any number from two to five. (iv) Must be zero. (v) Can be any number from zero to five. (vi) Can be any number from zero to two.	1	1	1

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DEPARTMENT OF MATHEMATICS

Course: Linear Algebra and Probability Theory	Quiz-II	Maximum marks: 10
Course code: MA231TC	Third semester 2023-2024 Branch: CS, CD, CY	Time: 11:45AM-12:15PM Date: 20-02-2024

Name:	Branch:	USN:

***Instructions to students**: Rough work can be done at the backside of the sheet.*

Sl. No.	Questions	M	BTL	CO
1	A sales firm receives, on average, 3 calls per hour on its toll-free number. Using Poisson distribution, for any given hour, the probability that it will receive at least 2 calls is _______. **Ans:** $\mathbf{0.8008}$	1	2	2
2	Suppose that the amount of time one spends in a bank is exponentially distributed with mean ten minutes. The probability that a customer will spend more than thirteen minutes in the bank is _______. **Ans:** $\mathbf{0.2725}$	1	2	2
3	A survey was conducted to measure the heights of men. In the survey, respondents were grouped by age. In the 20-29 age group, the heights were normally distributed, with a mean of 69.9 inches and a standard deviation of 3.0 inches. A participant is randomly selected, the probability that his height is between 66 and 72 inches is _________. **Ans:** $\mathbf{0.6612}$	2	2	2
4	If $f(x,y) = \begin{cases} cx^2y, 0 < x < 2,\ 1 < y < 2 \\ 0, \quad\quad otherwise \end{cases}$ is a joint probability density function, then the constant c is ______. **Ans:** $\boldsymbol{c = 0.1875}$	1	1	1
5	Let $T: \mathbb{R}^2 \to \mathbb{R}^2$ be a linear transformation and $T(1,0) = (2,-1)$ and $T(0,1) = (1,1)$. Then the image of $(1,3)$ is _______ and the preimage of $(0,4)$ is _______. **Ans:** $\boldsymbol{T(1,3) = (5,2)}$ **and preimage of** $\boldsymbol{(0,4) = \left(-\frac{4}{3}, \frac{8}{3}\right)}$	2	2	2
6	The Reflection matrix about the line $y = -x$ is ______. **Ans:** $\begin{bmatrix} \mathbf{0} & \mathbf{-1} \\ \mathbf{-1} & \mathbf{0} \end{bmatrix}$	1	1	2
7	The projection of the vector $(2,-4,4)^T$ onto the vector $(2,-1,1)^T$ is ______________. **Ans:** $\boldsymbol{(4,-2,2)^T}$	1	1	2
8	The nullity of a 3×5 matrix (Tick the correct option) (i) Can be any number from zero to two. **(ii) Can be any number from two to five.** (iii) Must be zero. (iv) Is three. (v) Can be any number from zero to five. (vi) Can be any number from zero to three. (vii) Must be two.	1	1	1

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Sl. No.	Questions	M	BTL	CO
1	An underground mine has 5 pumps installed for pumping out storm water, the probability of any one of the pumps failing during the storm is 0.125. Using binomial distribution, the probability that at least 2 pumps will be working is _______. **Ans: $\mathbf{0.9989}$**	1	2	2
2	Suppose the life expectancy X (in hours) of a transistor tube is exponential distributed with mean life 180. Then the probability that the tube will last between 36 and 90 hours is _______. **Ans: $\mathbf{0.2122}$**	1	2	2
3	The average waiting time to be seated for dinner at a popular restaurant is 23.5 minutes, with a standard deviation of 3.6 minutes. Assume the variable is normally distributed. When a patron arrives at the restaurant for dinner, the probability that the patron will have to wait between 14 and 21 minutes is ________. **Ans: $\mathbf{0.2395}$**	2	2	2
4	If $f(x,y) = \begin{cases} m(4-x-y), 0<x<1,\ 0<y<2 \\ 0, \quad otherwise \end{cases}$ is a joint probability density function, then the constant m is ______. **Ans: $\boldsymbol{m = 0.2}$**	1	1	1
5	Let $T: \mathbb{R}^2 \to \mathbb{R}^2$ be a linear transformation and $T(1,0) = (2,3)$ and $T(0,1) = (3,0)$. Then the image of $(1,2)$ is _______ and the preimage of $(-5,0)$ is _______. **Ans: $\boldsymbol{T(1,2) = (8,3)}$ and preimage of $\boldsymbol{(-5,0) = \left(0,-\frac{5}{3}\right)}$.**	2	2	2
6	The Rotation matrix through an angle of $30°$ in clockwise direction is ________. **Ans:** $\begin{bmatrix} \sqrt{3}/2 & 1/2 \\ -1/2 & \sqrt{3}/2 \end{bmatrix}$	1	1	2
7	The projection of the vector $(-2,12,2)^T$ onto the vector $(1,2,1)^T$ is _______________. **Ans: $\boldsymbol{(4,8,4)^T}$**	1	1	2
8	Consider a matrix $B = \begin{bmatrix} 2 & 4 & 0 \\ 4 & 8 & 0 \\ 3 & 6 & 1 \end{bmatrix}$.The dimension of the nullspace of B is _____. **Ans: 1**	1	1	1

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Sl. No.	Questions	M	BTL	CO
1	The probability that a bomb dropped from a plane will strike the target is 0.2. If six bombs are dropped, using binomial distribution, the probability that at least two will strike the target is _______. **Ans: $\mathbf{0.3446}$**	1	2	2
2	Suppose the lifetime X (in days) of a certain component C is exponentially distributed with mean life 120. Then the probability that C will last less than 24 days is ________. **Ans: $\mathbf{0.1812}$**	1	2	2
3	A sample of 100 dry battery cells produced by a certain company were tested for their length of life, and the test yielded the mean life as 12 hours, standard deviation as 3 hours. Using normal distribution, the probability that a dry battery selected at random will have life lengths between 10 and 14 hours is ______. **Ans: $\mathbf{0.4950}$**	2	2	2
4	If $f(x,y) = \begin{cases} \frac{6-x-y}{24}, 0 < x < 2,\ 0 < y < 4 \\ 0, \quad otherwise \end{cases}$ is a joint probability density function, then $P(x < 1, y < 2)$ is ______. **Ans: $\mathbf{0.375}$**	1	1	1
5	Let $T: \mathbb{R}^2 \to \mathbb{R}^2$ be a linear transformation and $T(1,0) = (4,3)$ and $T(0,1) = (6,2)$. Then the image of $(2,-1)$ is _______ and the preimage of $(0,-4)$ is _______. **Ans: $\boldsymbol{T(2,-1) = (2,4)}$ and preimage of $\boldsymbol{(0,-4) = \left(-\frac{12}{5}, \frac{8}{5}\right)}$.**	2	2	2
6	The Reflection matrix about the line $y = x$ is ________. **Ans: $\begin{bmatrix} \mathbf{0} & \mathbf{1} \\ \mathbf{1} & \mathbf{0} \end{bmatrix}$**	1	1	2
7	The projection of the vector $(2,6,4)^T$ onto the vector $(2,1,2)^T$ is ______________. **Ans: $\boldsymbol{(4,2,4)^T}$**	1	1	2
8	Consider a matrix $A = \begin{bmatrix} 1 & 4 & 0 \\ 4 & 8 & 6 \\ 2 & 6 & 6 \end{bmatrix}$.The dimension of the nullspace of A is _____. **Ans: 0**	1	1	1