Test / Exam Name: Test 1 **Standard: 12th Science** **Subject: Mathematics**

Instructions

1. RELATIONS VECTORS 3D PROBABILITY LPP REVISION FOR COMPARTMENT EXAM
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Q1. Find graphically, the maximum value of $z = 2x + 5y$, subject to constraints given below: **6 Marks**

$2x + 4y \leq 8$
$3x + y \leq 6$
$x + y \leq 4$
$x \geq 0, y \geq 0$

Q2. Solve the following L.P.P. graphically:

$\text{Minimise} \quad Z = 5x + 10y$
$\text{Subect to} \quad x + 2y \leq 120$
$\text{Constraints} \; x + y \geq 60$
$x - 2y \geq 0$
$\text{and} \quad x, y \geq 0$

Q3. Solve the following LPP graphically:
Minimise $z = 5x + 7y$
subject to the constraints
$2x + y \geq 8$
$x + 2y \geq 10$
$x, y \geq 0$

Q4. Solve the following L.P.P. graphically:

$\text{Miximise} \quad Z = 4x + y$
$\text{Subect to following constraints} \quad x + y \leq 50$
$3x + y \leq 90$
$x \geq 10$
$x, y \geq 0$

Q5. Solve the following linear programming problem graphically:
Maximise Z = 7x + 10y
subject to the constraints
$4x + 6y \leq 240$
$6x + 3y \leq 240$
$x \geq 10$
$x \geq 0, y \geq 0$

Q6. Maximise Z = x + 2y **4 Marks**
subject to the constraints
$x + 2y \geq 100$
$2x - y \leq 0$
$2x + y \leq 200$
$x, y \geq 0$
Solve the above LPP graphically.

Q7. Solve the following LPP graphically: **4 Marks**
Maximise Z = 1000x + 600y

subject to the constraints

$x + y \leq 200$

$x \geq 20$

$y - 4x \geq 0$

$x, y \geq 0.$

Q8. Solve the following L.P.P. graphically: **4 Marks**

Maximise Z = 20x + 10y

Subject to the following constraints $x + 2y \leq 28$,

$3x + y \leq 24$,

$x \geq 2$,

$x, y \geq 0$

Q9. Solve the following linear programming problem graphically : **4 Marks**

Maximise Z = 34x + 45y

under the following constraints

$x + y \leq 300$

$2x + 3y \leq 70$

$x \geq 0, y \geq 0$

Q10. Solve the following LPP graphically:

Maximise Z = 105x + 90y

subject to the constraints

$x + y \leq 50$

$2x + y \leq 80$

$x \geq 0, y \geq 0.$

Q11. Solve the following LPP graphically:

Minimise Z = 3x + 9y

subject to the constraints

$x + 3y \leq 60$

$x + y \geq 10$

$x \leq y$

$x \geq 0, y \geq 0.$

Q12. Solve the following linear programming problem graphically:

Maximise z = 5x - 2y,

subject to constraints

$x + 2y \leq 120$

$x + y \geq 60$

$x - 2y \geq 2$

$x, y \geq 0$

Q13. Solve the following linear programming problem graphically: **3 Marks**

Maximise z = 500x + 300y,

subject to constraints

$x + 2y \leq 12$

$2x + y \leq 12$

$4x + 5y \geq 20$

$x \geq 0, y \geq 0$

Q14. Solve the following linear programming problem graphically: **3 Marks**

Maximise z = 5x + 4y,

subject to constraints

$x + 2y \geq 4$

$3x + y \leq 6$

$x + y \leq 4$

$x, y \geq 0$

Q15. Solve the following linear programming problem graphically: **3 Marks**
Maximize P = 100x + 5y
subject to the constraints
$x + y \leq 300,$
$3x + y \leq 600,$
$y \leq x + 200,$
$x, y \geq 0.$

Q16. Solve the following linear programming problem graphically: **3 Marks**
Maximize z = 600x + 400y
subject to the constraints:
$x + 2y \leq 12,$
$2x + y \leq 12,$
$x + 1.25y \geq 5,$
$x, y \geq 0$

Q17. Find the position vector of the foot of perpendicular and the perpendicular distance from the point P with position vector $2\hat{i} + 3\hat{j} + 4\hat{k}$ to the plane $\vec{r}.(2\hat{i} + \hat{j} + 3\hat{k}) - 26 = 0$. Also find image of P in the plane.

Q18. Find the coordinates of the foot of the perpendicular and the perpendicular distance of the point P(3, 2, 1) from the plane 2x – y + z + 1 = 0. Find also, the image of the point in the plane.

Q19. If the lines $\frac{x-1}{-3} = \frac{y-2}{-2k} = \frac{z-3}{2}$ and $\frac{x-1}{k} = \frac{y-2}{1} = \frac{z-3}{5}$ are perpendicular, find the value of k and hence find the equation of plane containing these lines.

Q20. Find the equation of the plane containing two parallel lines $\frac{x-1}{2} = \frac{y+1}{-1} = \frac{z}{3}$ and $\frac{x}{4} = \frac{y-2}{-2} = \frac{z+1}{6}$. Also, find if the plane obtained contains the line $\frac{x-2}{3} = \frac{y-1}{1} = \frac{z-2}{5}$ or not.

Q21. From the point P (1, 2, 4), a perpendicular is drawn on the plane 2x + y – 2z + 3 = 0. Find the equation, the length and the coordinates of the foot of the perpendicular.

Q22. Show that the lines $\frac{x-2}{1} = \frac{y-2}{3} = \frac{z-3}{1}$ and $\frac{x-2}{1} = \frac{y-3}{4} = \frac{z-4}{2}$ intersect. Also, find the coordinates of the point of intersection. Find the equation of the plane containing the two lines.

Q23. If lines $\frac{x-1}{2} = \frac{y+1}{3} = \frac{z-1}{4}$ and $\frac{x-3}{1} = \frac{y-k}{2} = \frac{z}{1}$ intersect, then find the value of k and hence find the equation of the plane containing these lines.

Q24. Find the distance of the point (- 1, - 5, - 10), from the point of intersection of the line
$\vec{r} = (2\hat{i} - \hat{j} + 2\hat{k}) + \lambda(3\hat{i} + 4\hat{j} + 2\hat{k})$ and the plane $\vec{r} \cdot (\hat{i} - \hat{j} + \hat{k}) = 5.$

Q25. Find the coordinates of the foot of perpendicular and perpendicular distance from the point $P(4, 3, 2)$ to the plane $x + by + 3z = 2$. Also, find the image of P in the plane. **6 Marks**

Q26. Find the vector equation of the line passing through (2, 1, -1) and parallel to the line $\vec{r} = (\hat{i} + \hat{j}) + \lambda(2\hat{i} - \hat{j} + \hat{k})$. Also, find the distance between these two lines. **6 Marks**

Q27. Find the coordinates of the foot of the perpendicular Q drawn from P(3, 2, 1) to the plane 2x - y + z + 1 = 0. Also, find the distance PQ and the image of the point P treating this plane as a mirror. **6 Marks**

Q28. The image of point P(x, y, z) with respect to line $\frac{x}{1} = \frac{y-1}{2} = \frac{z-2}{3}$ is P' (1, 0, 7). Find the coordinates of point P. **5 Marks**

Q29. Find the vector and the Cartesian equations of a line passing through the point (1, 2, -4) and parallel to the line joining the points A (3, 3, -5) and B (1, 0, -11). Hence, find the distance between the two lines. **5 Marks**

Q30. **5 Marks**

Find the equations of the line passing through the points A (1, 2, 3) and B (3, 5, 9). Hence, find the coordinates of the points on this line which are at a distance of 14 units from point B.

Q31. Show that the lines $\frac{X+1}{3} = \frac{y+3}{5} = \frac{z+5}{7}$ and $\frac{x-2}{1} = \frac{y-4}{3} = \frac{z-6}{5}$ intersect. Also find their point of intersection. **4 Marks**

Q32. Find the length and the foot of the perpendicular drawn from the point (2, –1, 5) to the line **4 Marks**
$\frac{x-11}{10} = \frac{y+2}{-4} = \frac{z+8}{-11}$.

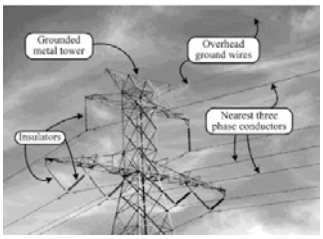
Q33. Find the shortest distance between the following lines whose vector equations are: **4 Marks**
$\vec{r} = (1 - t)\hat{i} + (t - 2)\hat{j} + (3 - 2t)\hat{k}$ and
$\vec{r} = (s + 1)\hat{i} + (2s - 1)\hat{j} - (2s + 1)\hat{k}$

Q34. Find the value of p, so that the lines $l_1 : \frac{1-x}{3} = \frac{7y-14}{p} = \frac{z-3}{2}$ and l_2: $\frac{7-7x}{3p} = \frac{y-5}{1} = \frac{6-z}{5}$ are perpendicular to each other. Also find the equations of a line passing through a point (3, 2,– 4) and parallel to line l_1. **4 Marks**

Q35. Find the Vector and Cartesian equations of the line passing through the point (1, 2, – 4) and perpendicular to the two lines $\frac{x-8}{3} = \frac{y+19}{-16} = \frac{z-10}{7}$ and $\frac{x-15}{3} = \frac{y-29}{8} = \frac{z-5}{-5}$.

Q36. Find the angle between the following pair of lines:
$\frac{-x+2}{-2} = \frac{y-1}{7} = \frac{z+3}{-3}$ and $\frac{x+2}{-1} = \frac{2y-8}{4} = \frac{z-5}{4}$
and check whether the lines are parallel or perpendicular.

Q37. Electrical transmission wires which are laid down in winters are stretched tightly to accommodate expansion in summers.



Two such wires lie along the following lines :
$l_1 : \frac{x+1}{3} = \frac{y-3}{-2} = \frac{z+2}{-1}$
$l_2 : \frac{x}{-1} = \frac{x-7}{3} = \frac{z+7}{-2}$
Based on the given information, answer the following questions:
Are the lines l_1 and l_2 coplanar? Justify your answer.
Find the point of intersection of the lines l_1 and l_2.

Q38. Two motorcycles A and B are running at the speed more than the allowed speed on the roads represented by the lines $\vec{r} = \lambda\left(\hat{i} + 2\hat{j} - \hat{k}\right)$ and $\vec{r} = \left(3\hat{i} + 3\hat{j}\right) + \mu(2\hat{i} + \hat{j} + \hat{k})$ respectively.

Based on the above information, answer the following Questions:

1. Find the shortest distance between the given lines.
2. Find the point at which the motorcycles may collide

Q39. Find the shortest distance between the lines **4 Marks**
$\vec{r} = 2\hat{i} - \hat{j} + \hat{k} + \lambda(3\hat{i} - 2\hat{j} + 5\hat{k})$
$\vec{r} = 3\hat{i} + 2\hat{j} + 4\hat{k} + \mu(4\hat{i} - \hat{j} + 3\hat{k})$

Q40. Find the shortest distance between the following lines:
$\frac{x-3}{1} = \frac{y-5}{-2} = \frac{z-7}{1}$ and $\frac{x+1}{7} = \frac{y+1}{-6} = \frac{z+1}{1}$ **4 Marks**

Q41. Find the distance between the planes 2x – y + 2z = 5 and 5x – 2.5y + 5z = 20. **1 Mark**

Q42. if $\vec{a} = 2\hat{i} + \hat{j} - \hat{k}, \vec{b} = 4\hat{i} - 7\hat{j} + \hat{k}$, find a vector $\vec{c}$ such that $\vec{a} \times \vec{c} = \vec{b}$ and $\vec{a} \,.\, \vec{c} = 6$. **4 Marks**

Q43. Find the position vector of a point R which divides the line joining two points P and Q whose position vectors are $(2\vec{a} + \vec{b})$ and $(\vec{a} - 3\vec{b})$ respectively, externally in the ratio 1:2. Also, show that P is the mid point of the line segment RQ. **4 Marks**

Q44. Find the angle between the vectors $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ If $\vec{a} = 2\hat{i} - \hat{j} + 3\hat{k}$ and $\vec{b} = 3\hat{i} + \hat{j} - 2\hat{k}$, and hence find a vector perpendicular to both $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$. **4 Marks**

Q45. If $\vec{a}$ and $\vec{b}$ are two vectors of equal magnitude and α is the angle between them, then prove that $\frac{|\vec{a}+\vec{b}|}{|\vec{a}-\vec{b}|} = \cot(\frac{\alpha}{2})$. **3 Marks**

Q46. ABCD is a parallelogram such that $\overrightarrow{AC} = \hat{i} = \hat{j}$ and $\overrightarrow{BD} = 2\hat{i} + \hat{j} = \hat{k}$ Find $\overrightarrow{AB}$ and $\overrightarrow{AD}$. Also, find the area of the parallelogram ABCD.

Q47. If $\vec{a} = 2\hat{i} - \hat{j} + \hat{k}, \vec{b} = \hat{i} + \hat{j} - 2\hat{k}$ and $\vec{c} = \hat{i} + 3\hat{j} - \hat{k}$ and the projection of vector $\vec{c} + \lambda\vec{b}$ on vector $\vec{a}$ is $2\sqrt{6}$, then find the value of λ.

Q48. If $\vec{a}, \vec{b}$ and $\vec{c}$ are mutually perpendicular vectors of equal magnitude, then prove that the vector$(2\vec{a} + \vec{b} + 2\vec{c})$ is equally inclined to both $\vec{a}, \vec{b}$and $\vec{c}$. Also, find the angle between a and $(2\vec{a} + \vec{b} + 2\vec{c})$.

Q49. The two adjacent sides of a parallelogram are represented by ai $2\hat{i} - 4\hat{j} - 5\hat{k}$ and $2\hat{i} - 4\hat{j} - 3\hat{k}$.Find the unit vectors parallel to its diagonals. Using the diagonal vectors, find the area of the parallelogram also.

Q50. If $\vec{a}, \vec{b}, \vec{c}$ are there vectors such that $\vec{a} \times \vec{b} = \vec{a} \times \vec{c}$ and $\vec{a} \times \vec{b} = \vec{a} \times \vec{c}, \vec{a} \neq 0$, then Show that $\vec{b} = \vec{c}$.

Q51. If $\vec{a}$ and $\vec{b}$ are unit vectors inclined at an angle 30° to each other, then find the area of the parallelogram with $(\vec{a} + 3\vec{b})$ and $(3\vec{a} + \vec{b})$ as adjacent sides.

Q52. Let $\vec{a} = \hat{i} + \hat{j}, \vec{b} = \hat{i} - \hat{j}$ and $\vec{c} = \hat{i} + \hat{j} + \hat{k}$. If $\hat{n}$ is a unit vector such that $\vec{a}.\hat{n} = 0$ and $\vec{b}.\hat{n} = 0$ then find $|\vec{c}.\hat{n}|$

Q53. If $\vec{a}$ and $\vec{b}$ areunit vectors and θ is the angle between them, then prove that $\sin\frac{\theta}{2} = \frac{1}{2}|\vec{a} - \vec{b}|$.

Q54. If $\vec{a}$ and $\vec{b}$ are two vectors such that $|\vec{a} + \vec{b}| = |\vec{b}|$, then prove that $(\vec{a} + 2\vec{b})$ s perpendicular to $\vec{a}$ **3 Marks**

Q55. $\vec{a}$ and $\vec{b}$ are two unit vectors such that $|2\vec{a} + 3\vec{b}| = |3\vec{a} - 2\vec{b}|$. Find the angle between $\vec{a}$ and $\vec{b}$. **2 Marks**

Q56. The two adjacent sides of a parallelogram are represented by vectors $2i - 4j + 5\hat{k}$ and $\hat{i} - 2\hat{j} - 3\hat{k}$.Find the unit vector parallel to one of its diagonals. Also, find the area of the parallelogram. **3 Marks**

Q57. If $\vec{a} = \hat{i} + \hat{j} + \hat{k}, \vec{a}.\vec{b} = 1$ and $\vec{a} \times \vec{b} = \hat{j} - \hat{k}$, then find $|\vec{b}|$ **2 Marks**

Q58. Find the vector equation of a line passing through a point with position vector $2\hat{i} - \hat{j} + \hat{k}$ and parallel to the line joining the points $-\hat{i} + 4\hat{j} + \hat{k}$ and $\hat{i} + 2\hat{j} + 2\hat{k}$ **2 Marks**

Q59. **2 Marks**

Write the projection of the vector $(\vec{b}+\vec{c})$ on the vector $\vec{a}$, where $\vec{a}=2\hat{i}-2\hat{j}+\hat{k}, \vec{b}=\hat{i}+2\hat{j}-2\hat{k}$ and $\vec{c}=2\hat{i}-\hat{j}+4\hat{k}$.

Q60. If $\vec{a}=2\vec{i}+y\vec{j}+\vec{k}$ and $\vec{b}=\vec{i}+2\vec{j}+3\vec{k}$ are two vectors for which the vector $(\vec{a}+\vec{b})$ is perpendicular to the vector $(\vec{a}-\vec{b})$, then find all the possible values of y. **2 Marks**

Q61. If $\vec{a}$ and $\vec{b}$ are two non-zero vectors such that $(\vec{a}+\vec{b}) \perp \vec{a}$ and $(2\vec{a}+\vec{b}) \perp \vec{b}$, then prove that $|\vec{b}|=\sqrt{2}\ |\vec{a}|$. **2 Marks**

Q62. In a parallelogram PQRS, $\overrightarrow{PQ}=3\hat{i}-2\hat{j}+2\hat{k}$ and $\overrightarrow{PS}=-\hat{i}-2\hat{k}$. Find $|\overrightarrow{PR}|$ and $|\overrightarrow{QS}|$. **2 Marks**

Q63. For two non-zero vectors $\vec{a}$ and $\vec{b}$, if $|\vec{a}-\vec{b}|=|\vec{a}+\vec{b}|$, then find the angle between $\vec{a}$ and $\vec{b}$. **2 Marks**

Q64. Find all the vectors of magnitude $3\sqrt{3}$ which are collinear to vector $\hat{i}+\hat{j}+\hat{k}$. **2 Marks**

Q65. If $|\vec{a}\times\vec{b}|^2+|\vec{a}\,.\,\vec{b}|^2=400$ and $|\vec{b}|=5$, than the value of $|\vec{a}|$

Q66. The value of $(\hat{i}\times\hat{j})\cdot\hat{j}+(\hat{j}\times\hat{i})\cdot\hat{k}$ is:

A 2 **B** 0 **C** 1 **D** -1

Q67. Suppose 5% of men and 0.25% of women have grey hair. Agrey haired person is selected at random.What is the probability of this person being male? Assume that there are equal number of males and females.

Q68. A bag contains 5 red and 3 black balls and another bag contains 2 red and 6 black balls. Two balls are drawn at random (without replacement) from one of the bags and both are found to be red. Find the probability that balls are drawn from the first bag.

Q69. There are two boxes I and II. Box I contains 3 red and 6 black balls. Box II contains 5 red and 'n' black balls. One of the two boxes, box I and box II is selected at random and a ball is drawn at random. The ball drawn is found to be red. If the probability that this red ball comes out from box II is $\frac{3}{5}$, find the value of 'n'.

Q70. A bag contains 4 balls. Two balls are drawn at random, and are found to be white. What is the probability that all balls are white?

Q71. An insurance company insured 2000 scooter drivers, 4000 car drivers and 6000 truck drivers. The probability of an accident involving a scooter, a car and a truck are 0.01, 0.03 and 0.15 respectively. One of the insured persons meets with an accident. What is the probability that he is a scooter driver.

Q72. A discrete random variable X has the following probability distribution:

x	**0**	**1**	**2**	**3**	**4**	**5**
P(X)	$4C^2$	$3C^2$	$2C^2$	C^2	C	2C

1. Find the value of C.
2. Find the mean of the distribution.
3. Given $\Sigma x_i^2 p_i = 14$, find the variance of the distribution.

Q73. In a bulb factory, machines A, B and C manufacture 60%, 30% and 10% bulbs respectively. 1%, 2% and 3% of the bulbs produced respectively by A, B and C are found to be defective. A bulb is picked up at random from the total production and found to be defective. Find the probability that this bulb was produced by the machine A. **6 Marks**

Q74. Coloured balls are distributed in three bags as shown in the following table: **6 Marks**

Bag	**Colour of the ball**		
	Black	**White**	**Red**
I	1	2	3
II	2	4	1

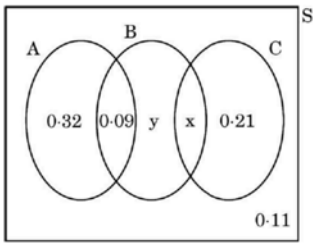
III	4	5	3

A bag is selected at random and then two balls are randomly drawn from the selected bag. They happen to be black and red. What is the probability that they came from bag I?

Q75. This section comprises 3 case study based questions of 4 marks each. **4 Marks**

There are different types of Yoga which involve the usage of different poses of Yoga Asanas, Meditation and Pranayam as shown in the figure below:

The Venn diagram below represents the probabilities of three different types of Yoga, A, B and C performed by the people of a society. Further, it is given that probability of a member performing type C Yoga is 0.44.



On the basis of the above information, answer the following questions:

1. Find the value of x.
2. Find the value of y.
3. Find $\mathrm{P}\left(\frac{\mathrm{C}}{\mathrm{B}}\right)$.

OR

3. Find the probability that a randomly selected person of the society does Yoga of type A or B but not C.

Q76. At the start of a cricket match, a coin is tossed and the team winning the toss has the opportunity to choose to bat or bowl. Such a coin is unbiased with equal probabilities of getting head and tail.

Based on the above information, answer the following questions:

1. If such a coin is tossed 2 times, then find the probability distribution of number of tails. 2
2. Find the probability of getting at least one head in three tosses of such a coin.

Q77. There are two boxes, namely box-1 and box-II. Box-I contains 3 red and 6 black balls. Box-II contains 5 red and 5 black balls. One of the two boxes, is selected at random and a ball is drawn at random. The ball drawn is found to be red. Find the probability that this red ball comes out from box-II. **4 Marks**

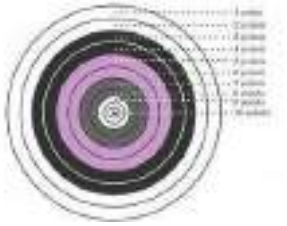
Q78. Three persons A, B and C apply for a job of manager in a private company. 4 Chances oftheir selection are in the ratio 1 : 2 : 4. The probability that A, B and C can introduce changes to increase the profits of a company are 0.8, 0.5 and 0.3 respectively. Ifincrease in the profit does not take place, find the probability that it is due to the appointment of A. **4 Marks**

Q79. A man is known to speak truth 7 out of 10 times. He threw a pair of dice and reports that doublet appeared. Find the probability that it was actually a doublet. **4 Marks**

Q80. A card from a pack of 52 playing cards is lost. From the remaining cards, 2 cards are drawn at random without replacment, and are found to be both aces. Find the Probability that lost card being an ace. **4 Marks**

Q81. **4 Marks**

In a game of Archery, each ring of the Archery target is valued. The centremost ring is worth 10 points and rest of the rings are allotted points 9 to 1 in sequential order moving outwards. Archer A is likely to earn 10 points with a probability of 0 - 8 and Archer B is likely the earn 10 points with a probability of 0-9.



Based on the above information, answer the following questions : If both of them hit the Archery target, then find the probability that

1. exactly one of them earns 10 points.
2. both of them earn 10 points.

Q82. In a factory, machine A produces 30% of total output, machine B produces 25% and the machine C produces the remaining output. The defective items produced by machines A, B and C are 1%, 1.2%, 2% respectively. An item is picked at random from a day's output and found to be defective. Find the probability that it was produced by machine B? **4 Marks**

Q83. A shopkeeper sells three types of flower seeds A1, A2, A3. They are sold in the form of a mixture, where the proportions of these seeds are 4 : 4 : 2, respectively. The germination rates of the three types of seeds are 45%, 60% and 35% respectively.

Based on the above information:

1. Calculate the probability that a randomly chosen seed will germinate;
2. Calculate the probability that the seed is of type A2, given that a randomly chosen seed germinates.

Q84. **Case Study**

According to recent research, air turbulence has increased in various regions around the world due to climate change. Turbulence makes flights bumpy and often delays the flights. Assume that, an airplane observes severe turbulence, moderate turbulence or light turbulence with equal probabilities. Further, the chance of an airplane reaching late to the destination are 55%, 37% and 17% due to severe, moderate and light turbulence respectively.

On the basis of the above information, answer the following questions:

1. Find the probability that an airplane reached its destination late.
2. If the airplane reached its destination late, find the probability that it was due to moderate turbulence.

Q85. E and F are two independent events such that $\mathrm{P}(\bar{\mathrm{a}}) = 0 \cdot 6$ and $\mathrm{P}(\mathrm{E} \cup \mathrm{F}) = 0 \cdot 6$ Find $\mathrm{P}(\mathrm{F})$ and $\mathrm{P}(\bar{\mathrm{E}} \cup \bar{\mathrm{F}})$.

Q86. The probability distribution of a random variable X is given below: **3 Marks**

X	1	2	3
P(x)	$\frac{k}{2}$	$\frac{k}{3}$	$\frac{k}{6}$

1. Find the value of k.
2. Find $\mathrm{P}(1 \leq \mathrm{X} < 3)$.
3. Find E(X), the mean of X.

Q87. A and B are independent events such that $\mathrm{P}(\mathrm{A} \cap \bar{\mathrm{B}}) = \frac{1}{4}$ and $\mathrm{P}(\bar{\mathrm{A}} \cap \mathrm{B}) = \frac{1}{6}$. Find P(A) and P(B). **3 Marks**

Q88. Three friends A, B and C got their photograph clicked. Find the probability that B is standing at the central position, given that A is standing at the left corner. **2 Marks**

Q89. Two cards are drawn successively with replacement from a well shuffled pack of 52 cards. Find the probability distribution of the number of spade cards. **2 Marks**

Q90. Let A and B be two events such that $P(A) = \frac{5}{8}, P(B) = \frac{1}{2}$ and $P(\frac{A}{B}) = \frac{3}{4}$ Find the value of $P\frac{B}{A}$. **2 Marks**

Q91. Probabilities of A and B solving a specific problem are $\frac{2}{3}$ and $\frac{3}{5}$ respectively. If both of them try independently to solve the problem, then find the probability that the problem is solved. **2 Marks**

Q92. A coin is tossed twice. The following table shows the probability distribution of number of tails: **2 Marks**

X	0	1	2
P(X)	K	6K	9K

1. Find the value of K.
2. Is the coin tossed biased or unbiased? Justify your answer.

Q93. Find $\left[P\left(\frac{B}{A}\right) + P\left(\frac{A}{B}\right)\right]$, if $P(A) = \frac{3}{10}, P(B) = \frac{2}{5}$ and $P(A \cup B) = \frac{3}{5}$. **2 Marks**

Q94. A bag contains 3 red and 4 white balls. Three balls are drawn at random, one-by-one without replacement from the bag. If the first ball drawn is red in colour, then find the probability that the remaining two balls drawn are also red in colour. **2 Marks**

Q95. A pair of dice is thrown. It is given that the sum of numbers appearing on both dice is an even number. Find the probability that the number appearing on at least one die is 3.

Q96. There are two bags. Bag I contains 1 red and 3 white balls, and Bag II contains 3 red and 5 white balls. A bag is selected at random and a ball is drawn from it. Find the probability that the ball so drawn is red in colour.

Q97. A die, whose faces are marked 1, 2, 3 in red and 4, 5, 6 in green, is tossed. Let A be the event ''number obtained is even'' and B be the event ''number obtained is red''. Find if A and B are independent events.

Q98. If $A = \begin{bmatrix} 2 & 3 & 1 \\ 1 & 2 & 2 \\ -3 & 1 & -1 \end{bmatrix}$, find A–1 and hence solve the system of equations 2x + y – 3z = 13, 3x + 2y + z = 4, x + 2y – z = 8.

Q99. If $A = \begin{bmatrix} 1 & -1 & 0 \\ 2 & 3 & 4 \\ 0 & 1 & 2 \end{bmatrix}$ and $B = A = \begin{bmatrix} 2 & 2 & -4 \\ -4 & 2 & -4 \\ 2 & -1 & 5 \end{bmatrix}$ are two square matrices, find AB and hence solve the system of linear equations x – y = 3, 2x + 3y + 4z = 17 and y + 2z = 7.

Q100. If $A = \begin{bmatrix} 1 & -2 & 0 \\ 2 & 1 & 3 \\ 0 & -2 & 1 \end{bmatrix}$ If A =, find A^{-1} and hence solve the system of equations x – 2y = 10, 2x + y + 3z = 8 and – 2y + z = 7.

Q101. Using matrices, solve the following system of equations: **6 Marks**

$2x - 3y + 5z = 11$

$3x + 2y - 4z = -5$

$x + y - 2z = -3$

Q102. Use product $\begin{bmatrix} 1 & -1 & 2 \\ 0 & 2 & -3 \\ 3 & -2 & 4 \end{bmatrix} \begin{bmatrix} -2 & 0 & 1 \\ 9 & 2 & -3 \\ 6 & 1 & -2 \end{bmatrix}$ to solve the system of equations x + 3z = 9, –x + 2y – 2z = 4, 2x – 3y + 4z = –3. **6 Marks**

Q103. If $A = \begin{pmatrix} 2 & 3 & 10 \\ 4 & -6 & 5 \\ 6 & 9 & -20 \end{pmatrix}$, find A^{-1}. Using A^{-1} Solve the system of equation $\frac{2}{x} + \frac{3}{y} + \frac{10}{z} = 2; \frac{4}{x} - \frac{6}{y} + \frac{5}{z} = 5; \frac{6}{x} + \frac{9}{y} - \frac{20}{z} = -4$ **6 Marks**

Q104. If $A = \begin{bmatrix} 5 & -1 & 4 \\ 2 & 3 & 5 \\ 5 & -2 & 6 \end{bmatrix}$, find A^{-1} and use it to solve the following system of equations: **6 Marks**

5x - y + 4z = 5
2x + 3y + 5z = 2
5x - 2y + 6z = -1

Q105. Solve the following system of equations by matrix method: **6 Marks**

x – y + 2z = 7
2x – y + 3z = 12
3x + 2y – z = 5

Q106. If $A = \begin{bmatrix} 1 & -2 & 0 \\ 2 & -1 & -1 \\ 0 & -2 & 1 \end{bmatrix}$ find A^{-1} and use it to solve the following system of equations: **5 Marks**

x - 2y = 10, 2x - y – z = 8, - 2y + z = 7

Q107. If $A = \begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$ and $B^{-1} = \begin{bmatrix} 3 & -1 & 1 \\ -15 & 6 & -5 \\ 5 & -2 & 2 \end{bmatrix}$, find $(AB)^{-1}$.

Q108. If $A = \begin{bmatrix} -1 & a & 0 \\ 1 & 2 & x \\ 3 & 1 & 1 \end{bmatrix}$ and $A^{-1} = \begin{bmatrix} 1 & -1 & 1 \\ -8 & 7 & -5 \\ b & y & 3 \end{bmatrix}$,find the value of (a + x) – (b + y).

Q109. If $A = \begin{bmatrix} -3 & 2 \\ 1 & -1 \end{bmatrix}$ and $I = \begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix}$, Find scalar k so that $A^2 + I = kA$.

Q110. If $(2 \ 1 \ 3)\begin{pmatrix} -1 & 0 & -1 \\ -1 & 1 & 0 \\ 0 & 1 & 1 \end{pmatrix}\begin{pmatrix} 1 \\ 0 \\ -1 \end{pmatrix} = A$, then write the order of matrix A.

Q111. If $A = \begin{bmatrix} 3 & 4 \\ 5 & 2 \end{bmatrix}$ and 2A + B is a null matrix, then B is equal to:

A $\begin{bmatrix} 6 & 8 \\ 10 & 4 \end{bmatrix}$ **B** $\begin{bmatrix} -6 & -8 \\ -10 & -4 \end{bmatrix}$

C $\begin{bmatrix} 5 & 8 \\ 10 & 3 \end{bmatrix}$ **D** $\begin{bmatrix} -5 & -8 \\ -10 & -3 \end{bmatrix}$

Q112. If $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$, show the $A^2 - 5A + 7I = 0$. Hence find A^{-1}.

Q113. Show that the relation R defined by (a, b) R (c, d) $\Rightarrow a + d = b + c$ on the $A \times A$, where $A = (1, 2, 3, \ldots\ldots\ldots\ldots 10)$ is an equivalence relation. Hence write the equivalence class [(3, 4)]; a, b, c, d ∈ A. **6 Marks**

Q114. Let $A = \{x \in Z : 0 \leq x \leq 12\}$. Show that, $R = \{(a, b) : a, b \in A, \ |a - b| \text{ is divisible by } 4\}$ is an equivalence relation. Find the set of all elements related to 1. Also write the equivalence class [2]. **6 Marks**

Q115. A relation R is defined on a set of real numbers R as **5 Marks**
R = {(x, y) : x . y is an irrational number}.
Check whether R is reflexive, symmetric and transitive or not.

Q116. Show that the relation S in the set A = {x ∈ Z : 0 ≤ x ≤ 12} given by S = {(a, b): a, b ∈ Z, | a – b | is divisible by 4} is an equivalence relation. Find the set of all elements related to 1. **4 Marks**

Q117. Let N be the set of natural numbers and R be the relation on N × N defined by (a, b) R (c, d) iff ad = bc for all a, b, c, d ∈ N. Show that R is an equivalence relation. **4 Marks**

Q118. Prove that the relation R in the set $A = (1, 2, 3, 4, 5)$ given by $R = (a, b) : |a\text{-}b| \text{is even},$ is an equivalence relation. **4 Marks**

Q119. Prove that the relation R on Z, defined by R {(x, y) : (x – y) is divisible by 5} is an equivalence relation. **4 Marks**

Q120. Let Z be the set of all integers and R be the relation on Z defined as R = {(a, b): a, b ∈ Z, and (a – b) is divisible by 5.} Prove that R is an equivalence relation. **4 Marks**

Q121. Prove that the relation R in the set A = {1, 2, 3, 4, 5, 6, 7} given by R = {(a, b) : |a - b| is even} is an equivalence relation. **4 Marks**

Q122. Show that the relation R on the set Z of all integers, given by R = {(a, b) : 2 divides (a - b)} is an equivalence relation. **4 Marks**

Q123. Show that the relation R on defined as $R = \{(a, b) : a \leq b\}$, is reflexive, and transitive but not symmetric.

Q124. Check whether the relation R defined on the set A = {1, 2, 3, 4, 5, 6} as R = {(a, b) : b = a + 1} is reflexive, symmetric or transitive.

Q125. Check whether the relation R in the set N of natural numbers given by R = {(a, b) : a is divisor of b} is reflexive, symmetric or transitive. Also determine whether R is an equivalence relation.

Q126. Show that the relation S in the set $A = \{x \in Z : 0 \leq x \leq 12\}$ given by $S = \{(a, b) : a, b \in Z, |a - b| \text{ is divisible by } 3\}$ is an equivalence relation.

Q127. Check if the relation R on the set A = {1, 2, 3, 4, 5, 6} defined as R = {(x, y) : y is divisible by x} is (i) symmetric (ii) transitive.

Q128. State the reason for the relation R in the set {1, 2, 3} given by R = {(1, 2), (2, 1)} not to be transitive.