

UNIT TEST

4

Time Allowed : 1½ Hours

Max. Marks : 50

Notes : 1. All questions are compulsory.

2. Marks have been indicated against each question.

1. If \vec{a} is a unit vector and $(\vec{x} - \vec{a}) \cdot (\vec{x} + \vec{a}) = 80$, then find $|\vec{x}|$. (1)

2. Find the distance of the point (2, 3, 4) from the plane : $\vec{r} \cdot (3\hat{i} - 6\hat{j} + 2\hat{k}) = -11$. (1)

3. If $P(A) = \frac{6}{11}$, $P(B) = \frac{5}{11}$ and $P(A \cup B) = \frac{7}{11}$, find $P(A/B)$ and $P(B/A)$. (2)

4. A coin is tossed 7 times. What is the probability that head appears an odd number of times ? (2)

5. If $\vec{a} = \hat{i} + \hat{j} + \hat{k}$, $\vec{b} = 4\hat{i} - 2\hat{j} + 3\hat{k}$ and $\vec{c} = \hat{i} - 2\hat{j} + \hat{k}$,
find a vector of magnitude 6 units, which is parallel to the vector $2\vec{a} - \vec{b} + 3\vec{c}$. (2)

6. Let $\vec{a} = \hat{i} + 4\hat{j} + 2\hat{k}$, $\vec{b} = 3\hat{i} - 2\hat{j} + 7\hat{k}$ and $\vec{c} = 2\hat{i} - \hat{j} + 4\hat{k}$,
Find a vector \vec{d} , which is perpendicular to both \vec{a} and \vec{b} and $\vec{c} \cdot \vec{d} = 15$. (4)

7. Find the equation of the perpendicular drawn from the point P(2, 4, -1) to the line :

$$\frac{x+5}{1} = \frac{y+3}{4} = \frac{z-6}{-9}.$$

Also write down the co-ordinates of the foot of the perpendicular from P to the line. (4)

8. Find the distance of the point (1, -2, 3) from the plane $x - y + z = 3$, measured parallel to the line $\frac{x}{2} = \frac{y}{3} = \frac{z}{-6}$. (4)

9. Maximize $Z = 3x + 2y$ subject to the constraints : $x + 2y \leq 10$, $3x + y \leq 15$, $x \geq 0$, $y \geq 0$, (4)

10. The probabilities of two students A and B coming to the school in time are $\frac{3}{7}$ and $\frac{5}{7}$ respectively. Assuming that the events, 'A coming in time' and 'B coming in time' are independent, find the probability of only one of them coming to the school in time. Write at least one advantage of coming to school in time. (4)

11. The sum of mean and variance of a binomial distribution for 6 trials is $\frac{10}{3}$. Find the binomial distribution. (4)

12. 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 co-ordinates of the foot of the perpendicular. (6)

13. Show that the lines : $\frac{x+3}{-3} = \frac{y-1}{1} = \frac{z-5}{5}$ and $\frac{x+1}{-1} = \frac{y-2}{2} = \frac{z-5}{5}$ are coplanar. Also find the equation of the plane. (6)

14. In answering a question on MCQ test with 4 choices per question, a student knows the answer, guesses or copies the answer. Let $\frac{1}{2}$ be the probability that he knows the answer, $\frac{1}{4}$ be the probability that he guesses and $\frac{1}{4}$ that he copies

it. Assuming that a student, who copies the answer, will be correct with probability $\frac{3}{4}$, what is the probability that the student knows the answer, given that he answered it correctly ?

Arjun does not know the answer to one of the questions in the test. The evaluation process has negative marking. Which value would Arjun violate if he resorts to unfair means ? How would an act like the above hamper his character development in the coming years ? (6)

Answers

1. 9.

2. 1 unit.

3. $\frac{4}{5}, \frac{2}{3}$.

4. $\frac{1}{2}$.

5. $\hat{i} - 2\hat{j} + 2\hat{k}$.

6. $\frac{5}{3}(32\hat{i} - \hat{j} - 14\hat{k})$.

7. $\frac{x-2}{6} = \frac{y-4}{3} = \frac{z+1}{2}; (-4, 1, -3)$.

8. 1 unit

9. 18 at (4, 3).

10. $\frac{26}{49}$.

11. $\left(\frac{2}{3} + \frac{1}{3}\right)^6$.

12. $\frac{x-1}{2} = \frac{y-2}{1} = \frac{z-4}{-2}; \frac{1}{3}$ unit; $\left(\frac{11}{9}, \frac{19}{9}, \frac{34}{9}\right)$.

13. $x - 2y + z = 0$.

14. $\frac{2}{3}$.
