Note:-
1. All Questions are compulsory.
2. Numbers on the right indicate full marks.

Section A

Q.1 Select and write the correct answer. **(4)**

1. The equation of the plane passing through (2, –1, 3) and making equal intercepts on the co-ordinate axes is _____

   A) x + y + z = 1   B) x + y + z = 2
   C) x + y + z = 3   D) x + y + z = 4

2. The equation of the plane passing through (2, 3, 4) and parallel to the plane 5x – 6y + 7z = 3 is _____

   A) 5x – 6y + 7z + 20 = 0   B) 5x – 6y + 7z – 20 = 0
   C) –5x + 6y – 7z + 3 = 0   D) 5x + 6y + 7z + 3 = 0

Q.2 Answer the following.

(3)

1. Find the cartesian equation of the plane passing through A(7, 8, 6) and parallel to the XY plane.

2. Find the vector equation of a plane which is at 42 unit distance from the origin and which is normal to the vector $2\hat{i} + \hat{j} - 2\hat{k}$

3. Find the vector equation of the line which passes through the point (3, 2, 1) and is parallel to the vector $2\hat{i} + 2\hat{j} - 3\hat{k}$

Section B
Attempt any Four

Q.3 Find the vector equation of the plane passing through the origln and containing the line **(2)** $\bar{r} = \left(\hat{i} + 4\hat{j} + \hat{k}\right) + \lambda\left(\hat{i} + 2\hat{j} + \hat{k}\right).$

Q.4 Reduce the equation $\bar{r} \cdot \left(6\hat{i} + 8\hat{j} + 24\hat{k}\right) = 13$ to normal form and hence find **(2)**

   (i) The length of the perpendicular from the origin to the plane
   (ii) Direction cosines of the normal.

Q.5 A line passes through (3, –1, 2) and is perpendicular to lines **(2)** $\bar{r} = \left(\hat{i} + \hat{j} - \hat{k}\right) + \lambda\left(2i - 2\hat{j} + \hat{k}\right)$ and
   $\bar{r} = \left(2\hat{i} + \hat{j} - 3\hat{k}\right) + \mu\left(\hat{i} - 2\hat{j} + 2\hat{k}\right).$ Find its equation.

Q.6 Find the cartesian equations of the line passing through A(2, 2, 1) and B(1, 3, 0) **(2)**

Q.7 Find the angle between planes $\bar{r} \cdot \left(-2\hat{i} + \hat{j} + 2\hat{k}\right) = 17$ and $\bar{r} \cdot \left(2\hat{i} + 2\hat{j} + \hat{k}\right) = 71$ **(2)**

Q.8 Find the cartesian equation of the line passing through A(3, 2, l) and B(1, 3, 1) **(2)**

Section C
Attempt any Two

Q.9 Find the acute angle between lines $\dfrac{x-1}{1} = \dfrac{y-2}{-1} = \dfrac{z-3}{2}$ and **(3)**

$\dfrac{x-1}{2} = \dfrac{y-2}{1} = \dfrac{z-3}{1}$

Q.10 The foot of the perpendicular drawn from the origin to a plane is M(l, 2, 0). Find the vector **(3)** equation of the plane.

Q.11 Find the distance of the point (1, 1, –l) from the plane $3x + 4y - 12z + 20 = 0$ **(3)**

Section D
Attempt any One

Q.12 By computing the shortest distance, determine whether $\bar{r} = \left(\hat{i} - \hat{j}\right) + \lambda\left(2\hat{i} + \hat{k}\right)$ **(4)**

and $\bar{r} = \left(2\hat{i} - \hat{j}\right) + \mu\left(\hat{i} + \hat{j} - \hat{k}\right)$ lines intersect each other.

Q.13 Show that lines $\dfrac{x+1}{-10} = \dfrac{y+3}{-1} = \dfrac{z-4}{1}$ and $\dfrac{x+10}{-1} = \dfrac{y+1}{-1} = \dfrac{z-1}{4}$ **(4)**

intersect each other.
Find the co-ordinates of their point of intersection.