जय श्री राधे कृष्णा जय श्री गिरिराज जी महाराज !!

EXAM NO: 12 | 3-D & D-E

TIME: 3 hrs
M.M = 100

SECTION: A (Two Marker questions) { give complete explanation }

Ans 1 Value of λ so that the line passing through the points $(1, -1, \lambda)$ and $(3, 4, -2)$ is perpendicular to the line through the points $(0, 3, 2)$ and $(3, 5, 6)$

(A) $\lambda = 3$ (B) $\lambda = 2$ (C) $\lambda = -2$ (D) $\lambda = -3$

Ans 2 → value of λ so that the line passing through the points $(4, 7, 8)$ and $(2, \lambda, 4)$ is parallel to the line through the points $(-1, -2, 1)$ and $(1, 2, 5)$

(A) $\lambda = 2$ (B) $\lambda = 3$ (C) $\lambda = 1$ (D) none of these

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Ans 3 → Angle between the two lines whose direction ratios are proportional to a, b, c and $b-c, c-a, a-b$ is

(A) π (B) $0°$ (C) $\frac{3\pi}{4}$ (D) $\pi/2$

Ans 4 → Distance of the point $(2, 3, 4)$ from the X-axis is

(A) 3 (B) 4 (C) 2 (D) 5

Ans 5 → Image of point $P(x, y, z)$ in XZ plane is

(A) $(-x, -y, -z)$ (B) $(x, -y, z)$, (C) $(-x, y, -z)$ (D) $(x, 0, z)$

Ans. 6 → If a line makes α, β, γ with the coordinate axes then the value of $\cos(2\alpha) + \cos(2\beta) + \cos(2\gamma)$ is

(A) 1 (B) -1 (C) 2 (D) 0

Qns 7 → The ratio in which the line segment joining (a, b, c) and $(-a, -c, -b)$ is divided by the XY plane is

(A) $b:c$ (B) $a:c$ (C) $b:d$ (D) $c:b$

Qns 8 → value of λ so that the lines

$$\frac{x-5}{5\lambda+2} = \frac{2-y}{5} = \frac{1-z}{-1} \quad \text{and} \quad \frac{x}{1} = \frac{2y+1}{4\lambda} = \frac{1-z}{-3} \quad \text{are}$$

perpendicular to each other

(A) $\frac{70}{11}$ (B) $\frac{11}{70}$ (C) -1 (D) 1

Qns 9 → Angle b/w the two lines

$$\frac{x-2}{3} = \frac{y+3}{-2},\ z=5 \quad \text{and} \quad \frac{x+1}{1} = \frac{2y-3}{3} = \frac{z-5}{2} \quad \text{is}$$

(A) $\pi/2$ (B) π (C) $\pi/3$ (D) $0°$

Qns 10 → Direction cosines of a line whose equation is

$$6x-2 = 3y+1 = 2z-4 \quad \text{are}$$

(A) $\frac{1}{\sqrt{14}}, \frac{2}{\sqrt{14}}, \frac{3}{\sqrt{14}}$ (B) $\frac{2}{\sqrt{14}}, \frac{3}{\sqrt{14}}, \frac{1}{\sqrt{14}}$ (C) $\frac{-1}{\sqrt{14}}, \frac{2}{\sqrt{14}}, \frac{3}{\sqrt{14}}$ (D) none

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Qn. 11 → The line $\frac{x-2}{3} = \frac{y+1}{4} = \frac{z-1}{0}$ is

(A) parallel to z-axis (B) perpendicular to x-axis

(C) perpendicular to z-axis (D) parallel to z-axis

Qns 12 → Equation of the plane passing through the point $(2,3,4)$ and making equal intercepts on the coordinate axes is

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(A) $2x+y+z=14$ (B) $2x+3y+4z=40$ (C) $x+y+z=12$
(D) $x+y+z=1$

Qns 13 → value of λ so that the planes $\vec{r}\cdot(2\hat{i}-\hat{j}+\lambda\hat{k})=5$ and $\vec{r}\cdot(2\hat{i}-2\hat{j}-2\hat{k})=5$ are perpendicular to each other is

(A) $\lambda=3$ (B) $\lambda=-1$ (C) $\lambda=-3$ (D) $\lambda=2$

Qn. 14 → A vector of magnitude 26 units normal to the plane $12x-3y+4z=1$ is

(A) $24\hat{i}-6\hat{j}+8\hat{k}$ (B) $12\hat{i}-3\hat{j}+4\hat{k}$ (C) $\hat{i}-\hat{j}+\hat{k}$ (D) none of them

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Qn. 15 → length of perpendicular from the origin to the plane $\vec{r}\cdot(\hat{i}-2\hat{j}+2\hat{k})+6=0$ is

(A) 6 (B) 3 (C) 2 (D) 18

Qn. 16 → Equation of the plane with Intercept 3 on X-axis and parallel to YOZ plane

(A) $y=3$ (B) $y+z=3$ (C) $x=3$ (D) $z=3$

Qn. 17 → distance of the point $(2,3,-5)$ from the plane $x+2y-2z-9=0$ is

(A) $\frac{2}{\sqrt{10}}$ (B) 3 (C) 9 (D) $\frac{5}{3}$

Qns 18 → If the product of distances of the point $(1,1,1)$ from the origin and the plane $x-y+z+\lambda=0$

be 5, then the value of λ is

(A) $\sqrt{3}$ (B) 4 (C) 12 (D) 9

Qn. 19 → Distance b/w the planes $2x - y + 3z = 4$ and $6x - 3y + 9z + 13 = 0$ is

(A) $\frac{25}{\sqrt{14}}$ (B) $\frac{5}{3\sqrt{14}}$ (C) $\frac{25}{9\sqrt{14}}$ (D) none of these

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Qn. 20 → If the line $\vec{r} = \hat{i}(1+2\lambda) + \hat{j}(-2+\lambda) + \hat{k}(1+2\lambda)$ is parallel to the plane $\vec{r}\cdot(3\hat{i} - 2\hat{j} + m\hat{k}) = 14$, then value of m is

(A) $m = 2$ (B) $m = -1$ (C) $m = 1$ (D) $m = -2$

Qn. 21 → angle b/w the line $\vec{r} = (\hat{i} + 2\hat{j} - \hat{k}) + \lambda(\hat{i} - \hat{j} + \hat{k})$ and the plane $\vec{r}\cdot(2\hat{i} - \hat{j} + \hat{k}) = 4$ is

(A) $\sin^{-1}\left(\frac{3}{2\sqrt{2}}\right)$ (B) $\cos^{-1}\left(\frac{1}{3}\right)$ (C) $\sin^{-1}\left(\frac{2\sqrt{2}}{5}\right)$ (D) $\cos^{-1}\left(\frac{2\sqrt{2}}{3}\right)$

Qn. 22 → value of λ, such that the line

$$\frac{x-2}{6} = \frac{y-1}{\lambda} = \frac{z+5}{-4}$$ is perpendicular to the

plane $3x - y - 2z = 7$

(A) $\frac{26}{\sqrt{3}}$ (B) 26 (C) $\frac{3}{\sqrt{13}}$ (D) 13

Qn. 23 → value of λ so that the lines

$\frac{x+1}{3} = \frac{y+3}{5} = \frac{z+5}{7}$ and $\frac{x-2}{\lambda} = \frac{y-4}{4} = \frac{z-6}{7}$ are coplanar is

(A) $\lambda = 2$ (B) $\lambda = 3$ (C) $\lambda = -1$ (D) $\lambda = 1$

Qn. 24 → Sum of order and degree of Differential equation

$$y + \frac{dy}{dx} = \frac{1}{4}\int y\,dx \quad \text{is}$$

(A) 4 (B) not defined (C) 2 (D) 3

Qn. 25 → Sum of order and degree of D·E

$$\left[1+\left(\frac{dy}{dx}\right)^2\right]^{3/2} = k\left(\frac{d^2y}{dx^2}\right) \quad \text{is}$$

(A) 4 (B) 3 (C) not defined (D) 6

Qn. 26 → Integrating factor of D·E

$$x\log x \frac{dy}{dx} + y = \frac{2}{x}\lg x \quad \text{is}$$

(A) $\log x$ (B) $\frac{1}{\lg x}$ (C) $x\lg x$ (D) $\frac{1}{x\lg x}$

Qn. 27 → Integrating factor of D·E

$$x\frac{dy}{dx} + y - x + xy\cot x = 0$$

(A) $\sin x$ (B) $x + \sin x$ (C) $x\sin x$ (D) $\log(x\sin x)$

Qn. 28 → Order of the differential equation of the family of circles of radius r is

(A) 3 (B) 1 (C) 2 (D) none of these

SECTION : B (FOUR MARKERS) (NO Jugaad Baazi)

Qn. 29 → Show that the solution of the D.E

$$(1+e^{2x})\,dy + (1+y^2)e^{x}\,dx = 0$$ with initial condition $x=0,\ y=1$ is $y = e^{-x}$

Qn. 30 → Show that the solution of the D.E

$$(x-y)(dx+dy) = dx - dy$$ with initial solution $y(0) = -1$ is $x - y = e^{x+y+1}$

Qn. 31 → Show that the solution of D.E

$$(x+y)dx + (x-y)dx = 0$$ with initial condition $y=1$ & $x=1$ is $\log(x^2+y^2) + 2\tan^{-1}\left(\frac{y}{x}\right) = \frac{\pi}{2} + \log 2$

Qn. 32 → Show that the solution of D.E

$$\frac{dy}{dx} - 2y = \cos(3x)$$ with initial condition $y(0) = 0$ is $ye^{-2x} = \frac{e^{-2x}}{13}(3\sin 3x - 2\cos 3x) + \frac{2}{13}$

Qn. 33 → Show that the equation of the line passing through the points $(1,2,-4)$ and perpendicular to the lines $\frac{x-8}{8} = \frac{y+9}{-16} = \frac{z-10}{7}$ and $\frac{x-15}{3} = \frac{y-29}{8} = \frac{z-5}{-5}$ is

$$\frac{x-1}{24} = \frac{y-2}{61} = \frac{z+4}{112}$$

Qn. 34 → Show that length of perpendicular from the point P (1, 6, 3) on the line $\frac{x}{1} = \frac{y-1}{2} = \frac{z-2}{3}$ is $\sqrt{13}$ units. Also show that image of point P in the plane is (1, 0, 7)

Qn 35 → Show that distance b/w the lines

$$\frac{x-1}{2} = \frac{y-2}{3} = \frac{z+4}{6} \quad \& \quad \frac{x-3}{4} = \frac{y-3}{6} = \frac{z+5}{12}$$ is

$\frac{\sqrt{293}}{7}$ units

Qn. 36 → A vector $\vec{n}$ of magnitude 8 units is inclined to x-axis at 45°, y-axis at 60° and an obtuse angle with z-axis. If a plane passes through the point $(\sqrt{2}, -1, 1)$ and is normal to $\vec{n}$, then show that the equation of the plane is

$\vec{r} \cdot (\sqrt{2}\hat{i} + \hat{j} - \hat{k}) = 0$

Qn 37 → Show that the equation of the plane passing through the points (2, 1, -1) and (-1, 3, 4) and perpendicular to the plane $x - 2y + 4z = 10$ is

$18x + 17y + 4z = 49$. Also show that the plane thus obtained contains the line

$\vec{r} = -\hat{i} + 3\hat{j} + 4\hat{k} + \lambda(3\hat{i} - 2\hat{j} - 5\hat{k})$

Qn. 38 → Show that the equations of the planes through the line of Intersection of the planes $\vec{r}\cdot(2\hat{i}+6\hat{j})+12=0$ and $\vec{r}\cdot(3\hat{i}-\hat{j}+4\hat{k})=0$ and which are at a unit distance from the origin are $\vec{r}\cdot(2\hat{i}+\hat{j}+2\hat{k})+3=0$ and $\vec{r}\cdot(-\hat{i}+2\hat{j}-2\hat{k})+3=0$

Qn. 39 → Show that the distance of the point $(1,-2,3)$ from the plane $x-y+z=5$ measured along a line parallel to the line $\frac{x}{2}=\frac{y}{3}=\frac{z}{-6}$ is 1

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