Internal Assessment [Mathematics, CC1]

Full Marks: 10   **Time: 30 Minutes**

Answer all Questions:

1. If the vector $\vec{F} = (x + 2y + az)\hat{i} + (bx - 3y - z)\hat{j} + (4x + cy + 2z)\hat{k}$ 'is irrotational then constants are

    a) a=4, b=2,c=-1   (b) a=4, b=2,c=1   (c) a=2, b=4,c=-1   (d) a=-1, b=1,c=4

2. If the vector field $\vec{F}$ given by $\vec{F} = (y + \sin z)\hat{i} + x\hat{j} + x\cos z\hat{k}$ is conservative then its scalar potential φ is

    (a) $\varphi = xy + z\sin z + c$ (b) $\varphi = xy + x\sin z + c$ (c) $\varphi = x + z\sin x + c$ (d)

    $\varphi = xy^2 + x\sin z + c$

3. The temperature of a points in space is given by $\phi = x^2 + y^2 - z$. A mosquito located at (1,1,2) desires to fly in such a direction that it will get warm as soon as possible. In what direction should it move?

    (a) $\frac{\sqrt{2}\hat{i} + 2\hat{j} - \hat{k}}{2}$ (b) $\frac{\hat{i} + \hat{j} + \hat{k}}{\sqrt{3}}$ (c) $\frac{2\hat{i} + 3\hat{j} + \hat{k}}{3}$ (d) $\frac{2\hat{i} + 2\hat{j} - \hat{k}}{3}$

4. Find the direction in which the directional derivative of $\phi = \frac{x^2 - y^2}{xy}$ at (1,1) is zero

    (a) $\frac{\hat{i} + \hat{j}}{\sqrt{2}}$ (b) $\frac{\hat{i} - \hat{j} + \hat{k}}{\sqrt{3}}$ (c) $\frac{\hat{i} - \hat{j}}{\sqrt{2}}$ (d) $\frac{\hat{i} + 2\hat{j} + \hat{k}}{\sqrt{6}}$

5. If the pair of straight line $x^2 - 2pxy - y^2 = 0$ are bisectors of the pair of straight lines $x^2 - 2qxy - y^2 = 0$ then pq=

    (a) 0   (b) 1   (c) 2   (d) -1

6. The Equation $6x^2 - 5xy - 6y^2 + 14x + 5y + 4 = 0$ represents a /an

    (a) Pair of straight lines   (b) Parabola   (c) Ellipse   (d) Hyperbola

7. The plane bisection the straight line joining the points (-1,2,3) and (3,-5,6) at right angle is

(a) $x + 5y + z = 0$ (b) $7x + 8y = 9$ (c) $x - 5y + 3z = 8$ (d) $4x - 7y + 3z = 28$

8. what is the projection of the line segment joining the points (3,3,5) and (5,4,3) on the straight line joining the points (2,-1,4) and (0,1,5) is

    (a)-9   (b) $\frac{1}{\sqrt{2}}$ (c) $\frac{3}{\sqrt{2}}$ (d) $\frac{-4}{5}$

9. What is/are the horizontal asymptotes of the equation $x^2 y^2 - 4(x^2 + y^2) - 8(x + y) + 16 = 0$

    (a) y=2,y=-2   (b)y=4,y=-4   (c)x=2,x=-2   (d) y=3,y=6

10. $\lim_{x \to 0} \frac{1}{1 + e^{\frac{1}{x}}} = ?$

(a) does not exist   (b) 0   (c) $\hat{i}$ (d)none of these