

SIPNA COLLEGE OF ENGINEERING & TECHNOLOGY, AMRAVATI.
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
QUESTION BANK

Branch: CSE

- **Year/Sem : 2nd/3rd**
- **Subject:- M – III**
- **Session:- 2023-24**
- **Unit : IV & VI**

Question Number	1	2	3	4	5	1	2	3	4	5
CO	4					6				

UNIT IV [Partial Differential Equation & Statistics]

Q1] Solve the following partial differential equations

1. Solve $z - px - qy = c\sqrt{1 + p^2 + q^2}$
2. Solve $p \times \tan y = q + 1$
3. Solve $\sqrt{p} + \sqrt{q} = 1$
4. Solve $\left(\frac{\partial z}{\partial y}\right)^2 + \left(\frac{\partial z}{\partial x}\right)^2 = \frac{3a^2}{z^2}$
5. Solve $p^2 - pq = 1 - z^2$
6. Solve $p^2y(1 + x^2) = qx^2$
7. Solve $pq = x^m y^n z^{2l}$
8. Solve $x^2p^2 + y^2q^2 = z^2$
9. Solve $(3y - 2z)p + (z - 3x)q = 2x - y$
10. Solve $yzp + xzq + 2xy = 0$
11. Solve $(y + z)p - (x + z)q = x - y$
12. Solve $(pq - p - q)(z - px - qy) = pq$

Q2] Fit a straight line $y = a + bx$ to the following data by the method of least square

i)

X	0	1	3	6	8
Y	1	3	2	5	5

ii)

X	1	2	3	4	5
Y	14	27	40	55	68

Q3] Find the coefficient of correlation between x & y for the following data

i)

X	1	2	3	4	5	6	7	8	9
Y	9	8	10	12	11	13	14	16	15

ii)

X	2.6	2.8	2.9	3.1	3.2	2.3	2.5	1.8
Y	5.9	6.0	6.2	6.2	7.6	7.0	7.5	5.5

iii)

X	1	2	3	4	5	6	7	8	9	10
Y	10	12	16	28	25	36	41	49	40	50

Q4] Fit a second degree parabola for the following data

i)

X	1	1.5	2	2.5	3	3.5	4
Y	1.1	1.3	1.6	2	2.7	3.4	4.1

ii)

X	1	2	3	4	5	6	7	8	9
Y	2	6	7	8	10	11	11	10	9

Q5] Obtain equations of lines of regression for the data

X	1	2	3	4	5
Y	2	5	3	8	7

UNIT VI]Vector Calculus]

Q.1.a) Find the directional derivative of $\phi = e^{2x} \cos yz$ at $(0,0,0)$ in the direction of the tangent to the curve $x = a \sin t, y = a \cos t, z = at$ at $t = \pi/4$

b) Find the directional derivatives of $f(x, y, z) = x^2 y^2 z^2$ at the point $(1, 1, -1)$ in the direction of tangent to the curve $x = e^t, y = 2 \sin t + 1, z = t - \cos t$ at $t=0$.

c) Find the rate of change of : $\phi = xyz$ at $(1,1,1)$ in the direction normal to the surface $x^2 y + y^2 x + z^2 y = 3$

Q.2. a) Find $\text{div } F$ and $\text{curl } F$, where: $F = \nabla(x^3 + y^3 + z^3 - 3xyz)$

b) Find the divergence and curl of vector given by

$$F = (xyz)i + 3x^2 yj + (xz^2 - yz^2)k$$

c) If $F = (x + y + 1)i + j - (x + y)k$ Prove that $F \bullet \text{curl } F = 0$

d) Show the vector $(y + z)i + (z + x)j + (x + y)k$ is solenoidal

Q.3. Prove that

a) $(\nabla \circ \vec{r}) = 3$

b) $\nabla \circ (r^n \vec{r}) = (n + 3) \vec{r}$

c) $\nabla \left(\frac{1}{r} \right) = -\frac{\vec{r}}{r^3}$

d) $\nabla r^n = n r^{n-2} \vec{r}$

Q.4.a) A vector field is given by $F = (\sin y)i + x(1 + \cos y)j$ Evaluate the line integral over a circular path given by $x^2 + y^2 = a^2, z = 0$

b) If $\vec{A} = (3x^2 + 6y)i - 14yzj + 20xz^2k$ then evaluate line integral $\oint \vec{A} \circ d\vec{r}$ from $(0,0,0)$ to $(1,1,1)$ along the curve $x = t, y = t^2, z = t^3$

Q5.a) A vector field given by $\vec{F} = (x^2 - yz)i + (y^2 - zx)j + (z^2 - xy)k$

Show that field is irrotational and find its scalar potential such that $\vec{F} = \nabla \phi$

b) A vector field given by $\vec{F} = (x^2 - y^2 + x)i - (2xy + y)j$

Show that field is irrotational and find its scalar potential such that $\vec{F} = \nabla \phi$
