Course Code: 23HS0831 **R23**

SIDDARTHA INSTITUTE OF SCIENCE AND TECHNOLOGY: PUTTUR

(AUTONOMOUS)

Siddharth Nagar, Narayanavanam Road – 517583

QUESTION BANK (DESCRIPTIVE)

Subject with Code: Differential Equations & Vector Calculus (23HS0831)

Course & Branch: B.Tech - Common to all

Year & Sem: I-B.Tech & II-Sem

Regulation: R23

UNIT –I

DIFFERENTIAL EQUATIONS OF FIRST ORDER AND FIRST DEGREE

1	a) Find the Integrating Factor of $\frac{dy}{dx} + y = x$	[L3][CO1]	**[2M]**
	b) Find the Integrating Factor of $\frac{dy}{dx}(x^2y^3 + xy) = 1$	[L3][CO1]	**[2M]**
	c) Verify the exactness of the differential equation $2xydy - (x^2 - y^2 + 1)dx = 0$	[L4][CO1]	**[2M]**
	d) State Newton's law of cooling.	[L1][CO1]	**[2M]**
	e) State Newton's Law of Natural growth and decay.	[L1][CO1]	**[2M]**
2	a) Solve $\boldsymbol{x\frac{dy}{dx} + y = logx}$.	[L3][CO1]	**[5M]**
	b) Solve $\frac{dy}{dx} + 2xy = e^{-x^2}$	[L3][CO1]	**[5M]**
3	a) Solve $(1 + y^2)dx = (tan^{-1}y - x)dy$	[L3][CO1]	**[5M]**
	b) Solve $(x + 1)\frac{dy}{dx} - y = e^{3x}(x + 1)^2$	[L3][CO1]	**[5M]**
4	a) Solve $\boldsymbol{x\frac{dy}{dx} + y = x^3y^6}$	[L3][CO1]	**[5M]**
	b) Solve $\frac{dy}{dx} + y.tanx = y^2\ secx$	[L3][CO1]	**[5M]**
5	a) Solve $(2x - y + 1)dx + (2y - x - 1)dy = 0$	[L3][CO1]	**[5M]**
	b) Solve $(y^2 - 2xy)dx + (2xy - x^2)dy = 0$	[L3][CO1]	**[5M]**
6	a) Solve $\frac{dy}{dx} + \frac{ycosx+siny+y}{sinx+xcosy+x} = 0$	[L3][CO1]	**[5M]**
	b) Solve $(x^2\text{-}ay)dx = (ax\text{-}y^2)dy$	[L3][CO1]	**[5M]**
7	a) Solve $x^2ydx\text{-}(x^3 + y^3)dy = 0$	[L3][CO1]	**[5M]**
	b) Solve $y(x^2y^2 + 2)dx + x(2 - 2x^2y^2)dy = 0$	[L3][CO1]	**[5M]**
8	A body is originally at 80^0 C and cools down to 60^0 C in 20 min. If the temperature of the air is 40^0 C, find the temperature of the body after 40 min.?	[L3][CO1]	**[10M]**
9	The temperature of a body drops from 100^0 C to 75^0 C in 10 minutes when the surrounding air is 20^0 C. What will be its temperature after half-an-hour? When will the temperature be 25^0 C ?	[L3][CO1]	**[10M]**
10	The number N of bacteria in a culture grew at a rate proportional to N. The value of N was initially 100 and increased to 332 in one hour. What was the value of N after $1\frac{1}{2}\ hour$?	[L1][CO1]	**[10M]**
11	An inductance of 3H and a resistance of 12Ω are connected in series with an e.m.f of 90 V. If the current is zero when t=0, what is the current at the end of 1 sec?	[L1][CO1]	**[10M]**

Course Code: 23HS0831 **R23**

UNIT –II

LINEAR DIFFERENTIAL EQUATIONS OF HIGHER ORDER (CONSTANT COEFFICIENTS)

1	a) Solve $\frac{d^2y}{dx^2} - a^2y = 0$	[L3][CO2]	**[2M]**
	b) Find the Particular Integral of $\frac{1}{D^2+3D+2}\ e^{4x}$	[L3][CO2]	**[2M]**
	c) Define Wronskian of functions of y_1 *and* y_2.	[L1][CO2]	**[2M]**
	d) What is the formula of L-C-R Circuit with e.m.f?	[L1][CO2]	**[2M]**
	e) Define Simple Harmonic motion.	[L1][CO2]	**[2M]**
2	a) Solve $(D^2 + 5D + 6)y = e^x$	[L3][CO2]	**[5M]**
	b) Solve $(D^2 - 4D + 3)y = 4e^{3x}$ given ; $y(0) = -1, y^1(0) = 3$.	[L3][CO2]	**[5M]**
3	a) Solve $(D^2 - 3D + 2)y = cos3x$	[L3][CO2]	**[5M]**
	b) Solve $(D^2 - 4D)y = e^x + sin3x.cos2x$	[L3][CO2]	**[5M]**
4	a) Solve $(D^2 + D + 1)y = x^3$	[L3][CO2]	**[5M]**
	b) Solve $(D^2 - 3D + 2)y = xe^{3x} + sin2x$	[L3][CO2]	**[5M]**
5	Solve $\frac{d^2y}{dx^2} + y = e^{-x} + x^3 + e^x sinx$.	[L3][CO2]	**[10M]**
6	a) Solve $(D^2 + 1)y = xsinx$ by the method of variation of parameters.	[L1][CO2]	**[5M]**
	b) Solve $(D^2 + 4)y = tan\,2\,x$ by the method of variation of parameters.	[L3][CO2]	**[5M]**
7	a) Solve $(D^2 - 2D)y = e^x\,sin\,x$ by the method of variation of parameters.	[L3][CO2]	**[5M]**
	b) Solve $(D^2 + 4)y = Sec2x$ by the method of variation of parameters.	[L3][CO2]	**[5M]**
8	a) Solve $(D^2 + 1)y = Co\,sec\,x$ by the method of variation of parameters.	[L3][CO2]	**[5M]**
	b) Solve $\frac{dx}{dt} = 3x + 2y :\ \frac{dy}{dt} + 5x + 3y = 0$.	[L3][CO2]	**[5M]**
9	a) Solve $\frac{dy}{dx} + y = z + e^x\ \ ; \frac{dz}{dx} + z = y + e^x$.	[L3][CO2]	**[5M]**
	b) Find the current 'i' in the L-C-R circuit assuming zero initial current and charge i , if R=80 ohms, L=20 henrys, C=0.01 farads and E=100 V.	[L3][CO2]	**[5M]**
10	A condenser of capacity 'C' discharged through an inductance 'L' and resistance 'R' in series and the charge 'q' at time 't' satisfies the equation $L\frac{d^2q}{dt^2} + R\frac{dq}{dt} + \frac{q}{c} = 0$. Given that L=0.25 henries, R=250 ohms, C=2x10^{-6} farads, and that when t=0, charge 'q' is 0.002 coulombs and the current $\frac{dq}{dt} = 0$, Obtain the value of 'q' in terms of 't'.	[L3][CO2]	**[10M]**
11	An uncharged condenser of capacity is charged applying an e.m.f $E\ sin\frac{t}{\sqrt{LC}}$ through leads of self-inductance L and negligible resistance. Prove that at time 't', the charge on one of the plates is $\frac{EC}{2}\left[sin\frac{t}{\sqrt{LC}} - \frac{t}{\sqrt{LC}}cos\frac{t}{\sqrt{LC}}\right]$.	[L5][CO2]	**[10M]**

Course Code: 23HS0831 **R23**

UNIT –III

PARTIAL DIFFERENTIAL EQUATIONS

1	a) Form the Partial differential equation by eliminating the arbitrary constants 'a' and 'b' form $z = ax + by + a^2 + b^2$.	[L6][CO3]	**[2M]**
	b) Form the Partial differential equation by eliminating the arbitrary constants 'a' and 'b' form $z = ax + by + \left(\frac{a}{b}\right) - b$.	[L6][CO3]	**[2M]**
	c) Form the Partial Differential Equation by eliminating the arbitrary functions from $z = f(x) + e^y . g(x)$	[L6][CO3]	**[2M]**
	d) Express the Lagrange's linear form of first order P.D.E.	[L2][CO4]	**[2M]**
	e) Define Homogeneous Linear Partial differential equation with constant coefficients of n^{th} order.	[L1][CO4]	**[2M]**
2	a) Form the Partial Differential Equation by eliminating the constants from $2z = \frac{x^2}{a^2} + \frac{y^2}{b^2}$	[L6][CO3]	**[5M]**
	b) Form the Partial Differential Equation by eliminating the constants from $(x-a)^2 + (y-b)^2 = z^2 cot^2\alpha$. where '$\alpha$' is a parameter.	[L6][CO3]	**[5M]**
3	a) Form the Partial Differential Equation by eliminating the constants from $z = a. log\left[\frac{b(y-1)}{(1-x)}\right]$.	[L6][CO3]	**[5M]**
	b) Form the Partial Differential Equation by eliminating the constants from $log(az-1) = x + ay + b$.	[L6][CO3]	**[5M]**
4	a) Form the Partial Differential Equation by eliminating the arbitrary functions from $xyz = f(x^2 + y^2 + z^2)$	[L6][CO3]	**[5M]**
	b) Form the Partial Differential Equation by eliminating the arbitrary functions from $z = xy + f(x^2 + y^2)$	[L6][CO3]	**[5M]**
5	a) Form the P.D.E by eliminating the arbitrary function from $\emptyset\left(\frac{y}{x}, x^2 + y^2 + z^2\right) = 0$	[L6][CO3]	**[5M]**
	b) Form the P.D.E by eliminating the arbitrary function from $f(x^2 + y^2, z - xy) = 0$	[L6][CO3]	**[5M]**
6	a) Solve $\frac{y^2 z}{x} p + xzq = y^2$	[L3][CO4]	**[5M]**
	b) Solve $(z-y)p + (x-z)q = y - x$	[L3][CO4]	**[5M]**
7	Solve $x(y-z)p + y(z-x)q = z(x-y)$	[L3][CO4]	**[10M]**
8	Solve $(x^2 - y^2 - z^2)p + 2xyq = 2xz$	[L3][CO4]	**[10M]**
9	a) Solve $2\frac{\partial^2 z}{\partial x^2} + 5\frac{\partial^2 z}{\partial x \partial y} + 2\frac{\partial^2 z}{\partial y^2} = 0$	[L3][CO4]	**[5M]**
	b) Solve r + 6s + 9t = 0 .	[L3][CO4]	**[5M]**
10	Solve $\frac{\partial^2 z}{\partial x^2} + 4\frac{\partial^2 z}{\partial x \partial y} - 5\frac{\partial^2 z}{\partial y^2} = \sin(2x + 3y)$	[L3][CO4]	**[10M]**
11	Solve $\frac{\partial^2 z}{\partial x^2} - \frac{\partial^2 z}{\partial x \partial y} = cosx\ cos2y$	[L3][CO4]	**[10M]**

Course Code: 23HS0831 **R23**

UNIT –IV
VECTOR DIFFERENTIATION

1	a) Define Divergence of a vector.	[L1][CO5]	**[2M]**
	b) Define Solenoidal Vector.	[L1][CO5]	**[2M]**
	c) Find $div\ \vec{r}\ where\ \vec{r} = x\vec{i} + y\vec{j} + z\vec{k}$	[L3][CO5]	**[2M]**
	d) Define Irrotational Vector.	[L1][CO5]	**[2M]**
	e) Find $(curl\bar{F})$ given that F = $3xy\bar{i} + 2y^2z\bar{j} + z^2y\bar{k}$ At the point (1-2,-1).	[L3][CO5]	**[2M]**
2	a) Find $grad\ f$ if $f = xz^4 - x^2y$ at a point $(1,-2,1)$ .Also find $\|\nabla f\|$	[L3][CO5]	**[5M]**
	b) If $\bar{r} = x\vec{i} + y\vec{j} + z\vec{k}$ then prove that $\nabla r = \frac{\bar{r}}{r}$	[L5][CO5]	**[5M]**
3	a) Find the directional derivative of $2xy + z^2$ at $(1,-1,3)$ in the direction of $\vec{i} + 2\vec{j} + 3\vec{k}$.	[L3][CO5]	**[5M]**
	b) Find the directional derivative of $xyz^2 + xz$ at $(1,1,1)$ in the direction of normal to the surface $3xy^2 + y = z$ at $(0,1,1)$.	[L3][CO5]	**[5M]**
5	a) Evaluate the angle between the normal to the surface $xy = z^2$ at the points $(4,1,2)and\ (3,3,-3)$.	[L5][CO5]	**[10M]**
	b) Find the maximum or greatest value of the directional derivative of $f = x^2yz^3$ at the point $(2,1,-1)$.	[L3][CO5]	**[5M]**
6	a) Find the divergence of $\bar{f} = (xyz)\vec{i} + (3x^2y)\vec{j} + (xz^2 - y^2z)\vec{k}$.	[L3][CO5]	**[5M]**
	b) Show that $\bar{f} = (x + 3y)\vec{i} + (y - 2z)\vec{j} + (x - 2z)\vec{k}$ is *solenoidal.*	[L1][CO5]	**[5M]**
7	a) Find $div\bar{f}\ \ if\ \bar{f}\ = grad(x^3 + y^3 + z^3 - 3xyz)$.	[L3][CO5]	**[5M]**
	b) Find the $curl$ of the vector $\bar{f} = (x + y + 1)\vec{i} + \vec{j} - (x + y)\vec{k}$.	[L3][CO5]	**[5M]**
8	a) Prove that $\bar{f} = (y + z)\vec{i} + (z + x)\vec{j} + (x + y)\vec{k}$ is *irrotational.*	[L5][CO5]	**[10M]**
	b) Find $curl\ \bar{f}$ if $\bar{f} = grad(x^3 + y^3 + z^3 - 3xyz)$.	[L3][CO5]	**[5M]**
9	a) Find 'a' if $\bar{f} = y(ax^2 + z)\vec{i} + x(y^2 - z^2)\vec{j} + 2xy(z - xy)\vec{k}$ is *solenoidal.*	[L3][CO5]	**[5M]**
	b) If $\bar{f} = (x + 2y + az)\vec{i} + (bx - 3y - z)\vec{j} + (4x + cy + 2z)\vec{k}$ is irrotational then find the constants *a,b and c.*	[L3][CO5]	**[5M]**
10	a) Prove that $div\left(curl\bar{f}\right) = 0$.	[L5][CO5]	**[5M]**
	b) Prove that $\nabla(r^n) = n\ r^{n-2}\bar{r}$	[L5][CO5]	**[5M]**
11	a) Prove that $curl\left(\emptyset\bar{f}\right) = (grad\emptyset) \times \bar{f} + \emptyset(curl\bar{f})$	[L5][CO5]	**[5M]**
	b) Prove that $\nabla.\left(\bar{f} \times \bar{g}\right) = \bar{g}.(\nabla \times \bar{f}) - \bar{f}.(\nabla \times \bar{g})$	[L5][CO5]	**[5M]**

Course Code: 23HS0831

R23

UNIT –V
VECTOR INTEGRATION

1	a) Define Line integral.	[L1][CO6]	**[2M]**
	b) Define work done by a force.	[L1][CO6]	**[2M]**
	c) State Green's theorem in the plane.	[L1][CO6]	**[2M]**
	d) State Stoke's theorem.	[L1][CO6]	**[2M]**
	e) State Gauss's divergence theorem.	[L1][CO6]	**[2M]**
2	a) If $\bar{F} = (5xy - 6x^2)\vec{i} + (2y - 4x)\vec{j}$ .Evaluate $\int_c \bar{F}.d\bar{r}$ along the curve $y = x^3$ in xy-plane from $(1,1) to (2,8)$.	[L5][CO6]	**[5M]**
	b) Find the work done by a force $\bar{F} = (2y+3)\vec{i} + (xz)\vec{j} + (yz - x)\vec{k}$ when it moves a particle from $(0,0,0) to (2,1,1)$ along the curve $x = 2t^2; y = t\,; z = t^3$.	[L3][CO6]	**[5M]**
3	If $\bar{F} = (x^2 + y^2)\vec{i} - (2xy)\vec{j}$. Evaluate $\int_c \bar{F}.d\bar{r}$ where 'C' is the rectangle in xy-plane bounded by $y = 0; y = b$ and $x = 0; x = a$.	[L5][CO6]	**[10M]**
4	a) Evaluate $\int_s \bar{F}.\bar{n}ds$. where $\bar{F} = 18z\vec{i} - 12\vec{j} + 3y\vec{k}$ and 'S' is the part of the surface of the plane $2x + 3y + 6z = 12$ located in the first octant.	[L5][CO6]	**[5M]**
	b) Evaluate $\int_s \bar{F}.\bar{n}ds$. where $\bar{F} = 12x^2y\vec{i} - 3yz\vec{j} + 2z\vec{k}$ and 'S' is the portion of the plane $x + y + z = 1$ located in the first octant.	[L5][CO6]	**[5M]**
5	a) If $\bar{F} = 2xz\vec{i} - x\vec{j} + y^2\vec{k}$. Evaluate $\int_v \bar{F}.dv$ where 'V' is the region bounded by the surfaces $x = 0; x = 2 : y = 0; y = 6$ and $z = x^2; z = 4$.	[L5][CO6]	**[5M]**
	b) If $\bar{F} = (2x^2 - 3z)\vec{i} - 2xy\vec{j} - 4x\vec{k}$ then Evaluate $\int_v \nabla.\bar{F}\,dv$ where 'V' is the closed region bounded by $x = 0; y = 0; z = 0$ and $2x + 2y + z = 4$.	[L5][CO6]	**[5M]**
6	Verify Green's theorem in a plane for $\oint_c (x^2\text{-}xy^3)dx + (y^2\text{-}2xy)dy$ where 'C' is a square with vertices $(0,0)(2,0)(2,2)$ *and* $(0,2)$.	[L4][CO6]	**[10M]**
7	a) Apply Green's theorem to evaluate $\oint_c (2x^2 - y^2)dx + (x^2 + y^2)dy$ where 'C' is the curve enclosed by the x-axis and upper half of the circle $x^2 + y^2 = a^2$.	[L3][CO6]	**[5M]**
	b) Evaluate by Green's theorem $\oint_c (y - sinx)dx + cosxdy$ where 'C' is the triangle enclosed by the lines $y = 0, x = \frac{\pi}{2}$ *and* $\pi y = 2x$.	[L5][CO6]	**[5M]**
8	Verify Stoke's theorem for the function $\bar{F} = x^2\bar{\imath} + xy\bar{\jmath}$ integrated round the square in the plane $z = 0$ whose sides are along the lines $x = 0, y = 0, x = a, y = a$.	[L3][CO6]	**[10M]**
9	Verify Stoke's theorem for $\vec{F} = (x^2 + y^2)\vec{\imath} - 2xy\vec{\jmath}$ taken around the rectangle bounded by the lines $x = \pm a$, $y = 0, y = b$.	[L4][CO6]	**[10M]**
10	Using Gauss's divergence theorem, Evaluate $\iint_s x^3dydz + x^2ydzdx + x^2zdxdy$ where 's' is the closed surface consisting of the cylinder $x^2 + y^2 = a^2$ and the circular discs $z = 0; z = b$.	[L3][CO6]	**[10M]**
11	Verify Gauss's divergence theorem for $\vec{F} = (x^3 - yz)\vec{\imath} - 2x^2y\vec{\jmath} + z\vec{k}$ taken over the surface of the cube bounded by the planes $x = y = z = a$ and coordinate planes.	[L4][CO6]	**[10M]**

Prepared by: Dept. of Mathematics

SIDDARTHA INSTITUTE OF SCIENCE AND TECHNOLOGY :: PUTTUR
(AUTONOMOUS)
Siddharth Nagar, Narayanavanam Road – 517583

QUESTION BANK (OBJECTIVE)

Subject with Code : DE&VC (23HS0831) **Course & Branch**: B.Tech – Common to All
Year & Sem: I-B.Tech & II-Sem **Regulation:** R23

UNIT – I

DIFFERENTIAL EQUATIONS OF FIRST ORDER AND FIRST DEGREE

1. In dx/dt which is independent variable ------- [ ]
   A) x B) t C) both D) d
2. In dr/dθ which is dependent variable -------- [ ]
   A) r B) θ C) both D)
3. The ordinary differential equation having how many dependent variables ------ [ ]
   A) 1 B) 2 C) both D) 1 or more
4. The ordinary differential equation having how many independent variables ------- [ ]
   A)1 B) 2 C)both D) 0
5. The Simultaneous differential 1st order equations with constant coefficients having how many dependent variables ----- [ ]
   A)1 B) 2 C) 3 D) 4
6. The Simultaneous differential 1st order equations with constant coefficients having how many independent variables ----- [ ]
   A) 1 B) 2 C) 3 D) 4
7. Which of the following is a solution to the differential equation $\frac{dy}{dx} + 3y = 0$ ------- [ ]
   A) $y = -3e^{x}$ B) $y = Ce^{x}$ C) $y = ce^{-3x}$ D) $y = ce^{3x}$
8. The degree of the D.E $\left(\frac{dy}{dx}\right)^2 + \frac{d^3y}{dx^3} + 2\frac{d^2y}{dx^2} + 3y = 0$ is ____________________ [ ]
   A) 0 B) 1 C) 2 D) 3
9. The equation of the form $\frac{dy}{dx} + P(x)y = Q(x)$ is called ---------------- [ ]
   A) Linear DE B) Exact DE C) Homogeneous DE D) Bernoulli's DE
10. An integrating factor of $\frac{dy}{dx} - \frac{y}{x} = x\ is ----$ [ ]
    A) $\frac{-1}{x}$ B) $\frac{-1}{2x}$ C) $\frac{1}{2x}$ D) $\frac{1}{x}$
11. The order of $x^3\frac{d^3y}{dx^3} + 2x^2\frac{d^2y}{dx^2} - 3y = x$ is ____________________ [ ]
    A)2 B)3 C)1 D)0
12. The equation Mdx + Ndy = 0 is exact if ------- [ ]
    A) $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$ B) $\frac{\partial M}{\partial x} = \frac{\partial N}{\partial x}$ C) $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial y}$ D) $\frac{\partial M}{\partial y} = -\frac{\partial N}{\partial x}$
13. The Linear differential equation of first order in x is [ ]
    A) $\frac{dx}{dy} + P(y)x = Q(y)$ B) $\frac{dy}{dx} + P(x)y = Q(x)$ C) $\frac{dy}{dx} + P(x)y = Q(x)y^n$ D) $M\,dx + N\,dy = 0$
14. The differential equation $x\frac{dy}{dx} + y = x^3y^6\ is\ a ----$ [ ]
    A) Homogeneous D.E B) Leibnitz's linear equation
    C) Bernoulli's D.E D)Nonlinear D.E
15. An integrating factor of $\frac{dy}{dx} - (tanx)y = x^2\ \ is ----$ [ ]
    A) $cosx$ B) $sinx$ C) $-cosx$ D) $-sinx$

16. The solution of the D.E $\frac{dy}{dx} = e^{x-y}$ is------------------- [ ]
A) $e^{x-y} = c$ B) $e^x - e^y = e^c$ C) $e^{-x} - e^{-y} = c$ D) $e^x + e^y = e^c$

17. The solution of the D.E $\frac{dy}{dx} = \frac{1+y^2}{1+x^2}$ is ----------- [ ]
A) $y = x(1+xy)$ B) $y + x = c(1+xy)$ C) $y - x = c(1+xy)$ D) $y - x = c(1-xy)$

18. The general solution of $\frac{x\,dy + y\,dx}{x^2y^2} = 0$ [ ]
A) $-\frac{1}{xy} = c$ B) $logxy = c$ C) $\frac{1}{x+y} = c$ D) $\frac{x}{y} = c$

19. The general solution of $\frac{dy}{dx} + y = e^{-x}$ ------------ [ ]
A) $xe^x = x + k$ B) $ye^{-x} = x + k$ C) $ye^x = x + k$ D) $ye^x = y + k$

20. The solution of $\frac{ye^x\,dx - e^x\,dy}{y^2} = 0$ is ----------- [ ]
A) $e^{x}/y = c$ B) $\frac{e^x}{y} = c$ C) $\frac{e^y}{x} = c$ D) $e^{xy} = c$

21. $\frac{1}{D^3}\cos x =$______ [ ]
A) $-\sin x$ B) $\cos x$ C) $\sin x$ D) $-\cos x$

22. If $f(x,y)dx + (xe^y + 2y)dy = 0$ is exact, then $f(x,y) =$----- [ ]
A) xe^y B) $y + xe^y$ C) e^x D) $x + e^y$

23. If $(x^2 - Ay)dx + (y^2 - 3x)dy = 0$ is exact, then the value of A is ------- [ ]
A) 0 B) 2 C) 4 D) 3

24. The I.F for the D.E $\frac{dy}{dx} + ysecx = tanx$ is ------- [ ]
A) $secx$ B) $tanx$ C) $secx + tanx$ D) sec^2x

25. The nature of the D.E $ysin2xdx - (y^2 + cos^2x)dy = 0$ is ----- [ ]
A) Homogeneous B) Linear C) Bernoulli's D) Exact

26. The solution of the D.E $y^1 = \frac{1}{x}$ is -------- [ ]
A) $y = logx + k$ B) $y = \frac{-1}{x^2} + k$ C) $x = logy + c$ D) $xy = c$

27. I.F of the D.E $\frac{dx}{dy} + \frac{3x}{y} = \frac{1}{y^2}$ is ------- [ ]
A) e^{y^3} B) y^3 C) x^3 D) $-y^3$

28. The solution of exact differential equation Mdx+Ndy=0 is ------- [ ]
A) $\int Mdx + \int N\,dy = c$ B) $\int Mdx + \int(terms\ free\ from\ x\ inN)\,dy = c$
C) $\int Mdx - \int N\,dy = 0$ D) y = C.F+ P.I

29. The solution of the D.E $\frac{dy}{dx} = m$ is ------- [ ]
A) $y = -mx + c$ B) $y = mx + c$ C) $y = x + c$ D) $y = -x + c$

30. The general solution of a non-homogeneous linear DE f(D)y = Q(x) [ ]
A) $y = y_c$ B) $y = y_p$ C) $y = y_c + y_p$ D) None

31. The differential equation $\frac{dy}{dx} + Py = Qy^n$ is known as ------- [ ]
A) Linear in y B) Linear in x C) Bernoulli's D.E D) Exact

32. Newton's Law of cooling is used to determine [ ]
A) Mass of a cooled object B) Temperature by an object after a given time
C) Volume of a cooled object D) Pressure exerted by a cooled object

33. The unit of resistivity is [ ]
A)Ohm B) Ohm-meter C) Ohm/meter D) Ohm/meter^2

34. Magnetic flux has the unit of [ ]
A)Newton B) Ampere turn C) Weber D) Telsa

35. Which of the following quantities consists of SI unit as WATT? [ ]
A)Force B) Charge C) Current D) Power

36. E.M.F can be induced in a circuit by [ ]
A)changing magnetic flux density B) Changing area of circuit C)changing the angle D)All of the above
37. Which of the following is active element [ ]
A)voltage source B) current source C)both D) none of the above
38. The branch current method uses [ ]
A) Kirchoff's voltage current B) Thevenin's theorem and Ohm's law
C) The Superposition theorem and Thevinin's theorem D) Kirchoff's current law and Ohm's law
39. The Newton's law of cooling is [ ]
A) $\theta=\theta_0+(\theta_1-\theta_0)e^{-kt}$ B) $\theta=\theta_0-(\theta_1-\theta_0)e^{-kt}$ C) $\theta=\theta_0+(\theta_1-\theta_0)e^{kt}$ D) $\theta=\theta_0+(\theta_1+\theta_0)e^{kt}$
40. Electric field originates at [ ]
A) Positive charge B) Negative charge
C)Neither positive nor negative charge D) Bothe positive and negative charge

UNIT-II

LINEAR DIFFERENTIAL EQUATIONS OF HIGHER ORDER (CONSTANT COEFFICIENTS)

1. The particular integral of the differential equation ⇄ $(D^2-1)y=x$ is --------- [ ]
A) -x B) x C) e^{-x} D) $e^{\frac{x^2}{2}}$
2. The particular integral of the differential equation $(D^2+5D+6)=e^{2x}$ is ------- [ ]
A) e^{2x} B) $\frac{1}{2}e^{2x}$ C) $\frac{1}{20}e^{2x}$ D) 0
3. The particular integral of $\frac{1}{(D-2)^2}3=$ ----------- [ ]
A)0 B) 3 C) $\frac{1}{4}$ D) $\frac{3}{4}$
4. The complementary function of $(D^2-9)y=0$ is-------- [ ]
A) $c_1e^{-x}+c_2e^{x}$ B) $c_1e^{-3x}+c_2e^{3x}$ C) $c_1e^{-9x}+c_2e^{9x}$ D) Ce^{3x}

5. The C. F of the equation $(D^3-D)y=x$ is ------------- [ ]
A) y = $c_1e^{x}+c_2e^{-x}$ B) $c_1+c_2e^{x}+c_3e^{-x}$ C) $c_1+c_2e^{x}$ D) y = $c_1+c_2xe^{x}+c_3xe^{-x}$
6. The P.I of the equation $(D^2+4)y=cos2x$ is------------ [ ]
A) $\frac{x}{4}cos2x$ B) $\frac{x}{4}sin2x$ C) $\frac{-x}{4}sin2x$ D) ±2i
7. To find P.I for the D.E. of the form $f(D)y=sin(ax+b)$, we replace D^2 by------- [ ]
A) $-a^2$ B) a^2 C) $-a$ D) a
8. Number of arbitrary constants in the particular solution of a linear DE are ` [ ]
A) 4 B) 2 C) 0 D) 1
9. The value of $\frac{1}{D^2+1}e^{x}$ is-------------- [ ]
A) $\frac{1}{2}$ B) $\frac{1}{2}e^{x}$ C) $\frac{1}{2}e^{-x}$ D) 0
10. What are the roots of auxiliary equation of $(D^2-D-6)y=0$ are -------- [ ]
A) -2,3 B) 2,3 C) 0,2 D) 1,3
11. The general solution of $(D^2-D-2)y=0$ is------------- [ ]
A) y= $c_1e^{-x}+c_2e^{-2x}$ B) y= $c_1e^{x}+c_2e^{2x}$
C) y= $c_1e^{-x}+c_2e^{2x}$ D) y= $c_1e^{-x}+c_2e^{x}$
12. The particular integral of the differential equation $(D+1)y=\sin x$ is ------- [ ]
A) 0 B) $\frac{1}{2}(\cos x)$ C) $\frac{1}{2}(\sin x-\cos x)$ D) $\sin x-\cos x$

13. The number of arbitrary constants in a solution of a D.E of order 'n' is ------- [ ]
A) $n+1$ B) n C) $n-1$ D) n^2

14. The general solution of $(D^2+a^2)y=0$ is -------------- [ ]
A) $y=c_1e^{-ax}+c_2e^{ax}$ B) y= $C_1\cos a\,x+C_2\sin a\,x$
C) $C_1+C_2\sin a\,x$ D) y= $C_1\cosh a\,x+C_2\sinh a\,x$

15. The value of $D^2\,x^2$ = ------- [ ]
A) 1 B) 2 C) 0 D) 2x

16. The roots of $y=c_1+(c_2+xc_3)e^{-x}$ ------- [ ]
A) 0,1,1 B) 0,-1,-1 C) 0,-1,1 D) 0,2,3

17. The roots of $y=c_1e^{-x}+(c_2+xc_3)e^{-2x}$ ------ [ ]
A) 1,1,1 B) -1,-2,-2 C) 0,-1,1 D) 0,2,2

18. The root s of $y=c_1e^{-x}+c_2e^{-2x}$ -------- [ ]
A)1,2 B)1,-2, C)-1,-2 D) -1,2

19. The roots of $y=e^{-x}(c_2\cos 2x+c_3\sin 2x)$ ------- [ ]
A)$1\pm2i$ B) $-1\pm2i$ C) $-2\pm i$ D) $2\pm i$

20. In the method of variation of parameter, the order of differential equation is ------ [ ]
A) 1 B)2 C)3 D) 0

21. The P.I in the method of variation of parameters is of the form y_p = A.u(x) + B.v(x), then A = [ ]
A) $-\int\frac{vR}{uv'-vu'}dx$ B) $\int\frac{uR}{uv'-vu'}dx$ C) $-\int\frac{vR}{uv'+vu'}dx$ D) $\int\frac{vR}{uv'-vu'}dx$

22. The complementary function of $(D^2-16)y=0$ ------ [ ]
A) $y=c_1e^{4x}$ B) $y=c_1+c_2e^{4x}$ C) $y=c_1+c_2x$ D) $y=c_1e^{4x}+c_2e^{-4x}$

23. The roots of the differential equation $(D^2+16)y=0$___ [ ]
A) 1 B) ±2i C) $\pm4i$ D) 4

24. The roots of the differential equation $(D^2+4)y=tan2x$ [ ]
A)1 B) 2 C) 3 D) ±2i

25. The roots of the differential equation $(D^2-a^2)y=sec\,ax$ ------ [ ]
A)$\pm ia$ B) $\pm a$ C) 0 D) x

26. The general form of Cauchy's equation in second order is ------ [ ]
A) $(a_1x^2D^2+a_2xD+a_3)y=f(X)$ B) $(XD^2+a_2xD+a_3)y=f(X)$
C) $(D^2+a_2D+a_3)y=f(X)$ D) None

27. The differential equation of L-C-R circuit without electro motive force (e.m.f) is -------- [ ]
A) $L\frac{d^2q}{dt^2}+R\frac{dq}{dt}+\frac{q}{c}=0$ B) $L\frac{di}{dt}+\frac{q}{c}=0$ C) $L\frac{di}{dt}+\frac{q}{t}+i=0$ D) None

28. In L-C-R circuit R represents ___ [ ]
A) Roaster B) Rays C) Resistance D) Restrict

29. If reduce variable into constant coefficient from $((1+x)^2D^2+(1+x)D+1)y=3\cos[log(1+x)]$ then RHS replace by = ---- [ ]
A) cos z B) 3cosz C) cos2z D) 3cos2z

30. If reduce variable into constant coefficient from $(x^2D^2+3xD+5)y=x\cos(\log x)$ then RHS replace by = ---- [ ]
A) $e^z\cos 2z$ B) $e^z\cos z$ C) $e^{2z}\cos 2z$ D) 3 cosz

31. The particular integral of $(D^2-6D+13)y=0$ ------- [ ]
A) cos x B) 1 C) 0 D) sinx

32. The particular integral of the equation $(D^2-9)y=e^{-3x}$ ----------- [ ]
A) $\frac{-x}{6}e^{-3x}$ B) $\frac{-x}{6}e^{3x}$ C) $\frac{x}{6}e^{-3x}$ D) 0

33. The particular integral of $(D^2 - 4)y = \sin 2x$ -------- [ ]

A) $\frac{-1}{8}\cos 2x$ B) $\frac{1}{8}\cos 2x$ C) $\frac{-1}{8}\sin 2x$ D) $\frac{1}{8}\sin 2x$

34. Reduce the equation $(x^2D^2 + xD + 1)y = \log x$ into ordinary differential with constant Coefficients (Where $\theta = d/dz$) = ------ [ ]

A) $(\theta^2 + 2\theta + 1)y = Z$ B) $(\theta^2 + 1)y = Z$ C) $(\theta^2 + \theta + 1)y = Z$ D) $(\theta^2 - 1)y = Z$

35. Let i be the current and q be the charge in the condenser plate at time t. Then Voltage drop across the resistance R = ------------ [ ]

A) qi B) Ri C) $\frac{q}{c}$ D) $R\frac{dq}{dt}$

36. The particular integral is $x^2y'' + xy' + y = 0$ ----------- [ ]

A) 1 B) Not exist C) 0 D) x

37. The value of $\frac{1}{D^2+1}e^x$ is=---- [ ]

A) $\frac{1}{2}e^x$ B) e^x C) $\frac{1}{3}e^x$ D) e^x

38. The P.I of the equation $(D^2 + 1)y = cosx$ is------------------ [ ]

A) $\frac{x}{2}cos2x$ B) $\frac{x}{4}sin2x$ C) $\frac{x}{2}\sin x$ D) $-\frac{x}{2}sin2x$

39. The general solution of $\frac{d^2y}{dx^2} + y = 0$ is ----------- [ ]

A) $y = c_1cosx + c_2sinx$ B) $c_1cosx - c_2sinx$ C) $y = c_1e^x + c_2e^{-x}$ D) C_1e^x

40. Let i be the current and q be the charge in the condenser plate at time t. Then Voltage drop across the inductance L = ------------ [ ]

A) $R\frac{dq}{dt}$ B) Ri C) $\frac{q}{c}$ D) $L\frac{d^2q}{dt^2}$

UNIT –III

PARTIAL DIFFERENTIAL EQUATIONS

1. The equation $\frac{\partial^2 z}{\partial x^2} + 2xy\left(\frac{\partial z}{\partial x}\right)^2 + \frac{\partial z}{\partial y} = 5$is of order ----- and degree ------ [ ]

A) 2, 1 B) 2, 2 C) 1, 1 D) 1, 2

2. The partial differential equation obtained by eliminating the arbitrary function f from $z = f\left(\frac{y}{x}\right)$ [ ]

A) $xp + yq = 0$ B) $xp - yq = 0$ C) $xp = yq$ D) p + q = 0

3. The partial differential equation obtained by eliminating the arbitrary constants a and b in $z = ax + (1 - a)y + b$ ------ [ ]

A) $xp + yq = 0$ B) $xp - yq = 0$ C) $xp = yq$ D) $p + q = 1$

4. The number of independent variables involved in PDE are [ ]

A) 1 B) 2 or more C) 2 D) 0

5. If $u = e^{xy}$then$\frac{\partial u}{\partial x}$ =?_______ [ ]

A) xe^{xy} B) $\frac{e^{xy}}{y}$ C) ye^{xy} D) $\frac{e^{xy}}{x}$

6. The partial differential equation obtained from $z = ax + by + ab$ by eliminating a and b is [ ]

A) $xp+yq+pq=z$ B) $xp-yq=z$ C) $2xp+2yq=z$ D) $2xp-2yq=z^2$

7. If $z = f(ax - by)$ then$\frac{\partial z}{\partial x} + \frac{\partial z}{\partial y}$ =________ [ ]

A) $(a - b)f'$ B) $(a + b)f'$ C) $(ax - by)f'$ D) $(ax - by)$

8. If $u = sin^{-1}\left(\frac{x}{y}\right)$then$\frac{\partial u}{\partial y}$ =_______ [ ]

A) $\frac{-x}{\sqrt{x^2-y^2}}$ B) $\frac{y}{\sqrt{x^2-y^2}}$ C) $\frac{1}{\sqrt{y^2-x^2}}$ D) $-\frac{x}{y\sqrt{y^2-x^2}}$

9. The order of the differential equation obtained by eliminating f from $z = f(x^2 + y^2)$ is --- [ ]

A) First B) Second C) Third D) Zero

10. If $u = e^x \sin y$then$\left(\frac{\partial u}{\partial x}\right)^2 + \left(\frac{\partial u}{\partial y}\right)^2$ =_______ [ ]

A) e^x B) e^{2x} C) $e^x \cos y$ D) e^{-2x}

11. By eliminating a and b from $z = a(x + y) + b$, the PDE formed is --------- [ ]

A)$\partial z/\partial x = \partial y/\partial z$ B)$\partial z/\partial x = \partial z/\partial y$ C)$\partial y/\partial x = \partial z/\partial y$ D)$\partial x/\partial y = \partial y/\partial z$

12. By eliminating the arbitrary constants from $z = a^2x + ay^2 + b$, the PDE formed is ------ [ ]

A) $4y^2p = q^2$ B)$4y^2p^2 = q^2$ C)$4y^3p^2 = q^2$ D)$4yp = q$

13. The PDE is obtained by eliminating the arbitrary function f from $z = f(xy)$ [ ]

A) $xp + yq = 0$ B) $xp - yq = 0$ C) $py - qy = 0$ D) $p + q = 0$

14. The P.D.E obtained by eliminating the arbitrary function f from $z = x^n f\left(\frac{y}{x}\right)$ ------- [ ]

A) $xp + yq = nz$ B) $xp - yq = nz$ C) $xp + yq = z$ D) $py + xq = nz$

15. The PDE is obtained by eliminating the arbitrary function f from $z = f(x - y)$ [ ]

A) p + q = 1 B) $p - q = 1$ C) $py - qy = 0$ D) $p + q = 0$

16. If $u = \sin x\, y$thenu$_{xx}$ =_______ [ ]

A) $y \sin x\, y$ B) $x \cos x\, y$ C) $-y^2u$ D) u

17. The order of PDE obtained by eliminating f from $z = f(x - at) + g(x + at)$ is____ [ ]

A) Second B) First C) Third D) 0

18. By eliminating a,b from $z = axy + b$, the PDE formed is ------ [ ]

A) $p = q$ B)$px = qy$ C) $px + qy = 0$ D) $p + q = 0$

19. By eliminating f from $z = f(\sin x + \cos y)$, the PDE formed is_______ [ ]

A) $p \cos x + q \sin y = 0$ B) $p \sin y + q \cos x = 1$ C) $p \cos x + q \sin y = 1$ D) $p \sin y + q \cos x = 0$

20. By eliminating f from $z = f(x^2 - y^2)$, the PDE formed is_______ [ ]

A)$p = q$ B)$px = qy$ C) $py + qx = 0$ D) $p + q = 0$

21. By eliminating a,b from $z = (a + x)(b + y)$, the PDE formed is_______ [ ]

A) $z = pq$ B)$z = p + q$ C) $z = \frac{p}{q}$ D) $z = p - q$

22. By eliminating a,b from $z = axe^y + b$, the PDE formed is_______ [ ]

A) $p + q = 0$ B)$p = q$ C) $qy = px$ D) $q = px$

23. If $y = e^{x+y}$then $\frac{\partial^2 y}{\partial y \partial x}$ = __________ [ ]

A)y B) e^{yx} C) e^{x-y} D)e^{-x-y}

24. If $u = cos^{-1}\left(\frac{x}{y}\right)$then$\frac{\partial u}{\partial x}$ =_______ [ ]

A) $\frac{-x}{\sqrt{x^2-y^2}}$ B) $\frac{y}{\sqrt{x^2-y^2}}$ C) $\frac{1}{\sqrt{y^2-x^2}}$ D) $-\frac{1}{\sqrt{y^2-x^2}}$

25. If $u = \cos x\, y$ then $\frac{\partial u}{\partial y}$ =_______ [ ]

A) $-x \sin x\, y$ B) $x \sin x\, y$ C) $-\sin x\, y$ D) $y \sin x\, y$

26. The solution of $e^x dy = e^y dx$is ------- [ ]

A)$e^{-x} + e^{-y} = c$ B) $e^{-x} - e^{-y} = c$ C)$e^x + e^y = c$ D)$e^x - e^y = c$

27. If $u = e^{\frac{x}{y}}$ then $\left(\frac{\partial u}{\partial x}\right)^2$ =_______ [ ]

A) $\frac{e^{\frac{2x}{y}}}{y^2}$ B) $-\frac{e^{\frac{2y}{x}}}{x^2}$ C) $-\frac{1}{x^2}$ D) $\frac{1}{xy}$

28. If $u = \log x\,y$ then $\frac{\partial^2 u}{\partial x^2} =$_______ [ ]

A) $\frac{1}{x}$ B) $-\frac{1}{x}$ C) $-\frac{1}{x^2}$ D) $\frac{1}{xy}$

29. The solution of $\frac{1}{x}dx = \frac{1}{y}dy$ is ------- [ ]

A) $x = y$ B) $x = cy$ C) $x + y = c$ D) $x - y = c$

30. $\log x = y + c$is the solution of_____________ [ ]

A) $dx = xdy$ B) $dy = ydx$ C) $\frac{1}{x}dx = \frac{1}{y}dy$ D) $dy = dx$

31. The degree of $\left(\frac{\partial^2 u}{\partial t^2}\right)^2 - c^2\left(\frac{\partial^2 u}{\partial x^2}\right)^2 = 0$ [ ]

A) 2 B) 3 C) 1 D) 0

32. Which of the following is not a homogeneous equation? [ ]

A) $\frac{\partial^2 u}{\partial t^2} - c^2\frac{\partial^2 u}{\partial x^2}$ B) $\frac{\partial^2 u}{\partial t^2} + \frac{\partial^2 u}{\partial x^2}$

C) $\frac{\partial^2 u}{\partial x^2} + \left(\frac{\partial^2 u}{\partial x\partial y}\right)^2 + \frac{\partial^2 u}{\partial x^2} = x^2 + y^2$ D) $\frac{\partial u}{\partial t} - T\frac{\partial^2 u}{\partial x^2} = 0$

33. The complementary function of $(D^2 - DD' - 6D'^2)z = 0$ [ ]

A) $\varphi_1(y - 2x) + \varphi_2(y + 3x)$ B) $\varphi_1(y + 2x) + \varphi_2(y + 3x)$

C) $\varphi_1(y - 2x) + \varphi_2(2y - 3x)$ D) $\varphi_1(y - 2x) + \varphi_2(2y + 3x)$

34. The particular integral of $(2D^2 + 7DD' - D'^2)z = 0$ [ ]

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

35. The complementary function of $(D^2 - 2DD')z = \sin x \cos 2y$ [ ]

A) $\varphi_1(y) + \varphi_2(y - 2x)$ B) $\varphi_1(2y) + \varphi_2(y + 2x)$

C) $\varphi_1(y) + \varphi_2(2y - x)$ D) $\varphi_1(y) + \varphi_2(y + 2x)$

36. The particular integral of $(D^2 - 2DD' + D'^2)z = e^{x+2y}$ [ ]

A) 0 B) e^{x-2y} C) e^{x+2y} D) $2e^{x+2y}$

37. The particular integral of $(2D^2 + 7DD' - D'^2)z = e^x$ [ ]

A) $-e^x$ B) e^x C) $-\frac{1}{2}e^x$ D)$\frac{1}{2}e^x$

38. What is the degree of the homogeneous partial differential equation, $\frac{\partial^2 u}{\partial t^2} - c^2\frac{\partial^2 u}{\partial x^2} = 0$ [ ]

A) Second-degree B) First-degree C) Third-degree D) Zero-degree

39. The particular integral of $(D^2 - 2DD' + D'^2)z = x^3$ [ ]

A) $\frac{x^3}{20}$ B) $\frac{x^4}{20}$ C) $-\frac{x^5}{20}$ D)$\frac{x^5}{20}$

40. The solution of$z = px + qy + 2\sqrt{pq}$is ------- [ ]

A)$z = ax + by + 2\sqrt{a^2 + b^2}$ B)$z = ax + by + 4a^2b^2$

C)$z = ax + by + \sqrt{2ab}$ D)$z = ax + by + 2\sqrt{ab}$

UNIT-IV

VECTOR DIFFERENTIATION

1. If $\Phi = x^2 + y^2 + z^2 - 3xyz$ then curl(grad Φ) = [ ]

A) 0 B)6x+6y+6z C) x+y+z D) -10x

2. The greatest value of directional derivative of function f =y^2+2 at (0,2,-1) [ ]

A) 1 B) 2 C) 3 D) 4

3. The grad f of the function f=xyz at (1,1,1) [ ]

A) $\bar{i} + \bar{j} + \bar{k}$B) $4\bar{i} + 4\bar{j} + 4\bar{k}$ C) $9\bar{i} + 9\bar{j} + 9\bar{k}$ D) 0

4. If $\overline{a}=\overline{i}+2\overline{j}-3\overline{k}$ then $|\overline{a}|=$ [ ]

A) $\sqrt{15}$ B) $\sqrt{14}$ C) $\sqrt{17}$ D) $\sqrt{19}$

5. If $\overline{f}=x\overline{i}+y\overline{j}-z\overline{k}$ then $\nabla.\overline{f}=$ [ ]

A) 0 B) 1 C)2 D) 3

6. If $\overline{f}=\overline{i}+\overline{j}+\overline{k}$ then ∇x $\overline{f}$ = [ ]

A) 3 B)2 C)1 D) 0

7. If $\Phi = x^2+ y^2+ z^2- 3xyz$ then div(grad Φ) = [ ]

A)0 B) 6x+6y+6z C)x+y+z D)6

8. If $\overline{r}=x\overline{i}+y\overline{j}+z\overline{k}$ then div $\overline{r}$ = [ ]

A)3 B) 0 C) -2 D) None

9. The greatest value of directional derivative of function f $=x^2$ at (2,-8,-1) [ ]

A) 1 B) 2 C) 3 D) 4

10. The grad f of the function f=xyz at (2,2,2) [ ]

A) $\overline{i}+\overline{j}+\overline{k}$ B) $4\overline{i}+4\overline{j}+4\overline{k}$ C) $9\overline{i}+9\overline{j}+9\overline{k}$ D) 0

11. If $\overline{r}=x\overline{i}+y\overline{j}+z\overline{k}$ then curl $\overline{r}$ = [ ]

A) 0 B) $3x\overline{i}$ C) $3y\overline{j}$ D)$3z\overline{j}$

12. If $\overline{a}$ is a constant vector then curl ($\overline{r}$x$\overline{a}$)= [ ]

A) $2\overline{a}$ B) $-2\overline{a}$ C) $\overline{a}$ D)$-\overline{a}$

13. If $\overline{f}=\overline{i}+\overline{j}-\overline{k}$ then ∇x $\overline{f}$ = [ ]

A) 3 B)2 C)1 D)0

14. If$\overline{a}$and $\overline{b}$ are Irrotational vectors, then $\overline{a}$ x$\overline{b}$ is [ ]

A) Solenoidal vector B) Irrotational vector C)Free vector D) scalar

15. If $\overline{r}=x\overline{i}$ then $\nabla.\overline{r}$ is [ ]

A) 0 B) 1 C) 3 D) 4

16. The greatest value of directional derivative of function f $=x^2+16$ at (2,2,-2) [ ]

A) 1 B) 2 C) 3 D) 4

17. div $\overline{f}$ is denoted by [ ]

A) $\nabla.\overline{f}$ B) ∇x $\overline{f}$ C)$\nabla+\overline{f}$ D) $\nabla-\overline{f}$

18. If f $=x+y+z$ then grad f = [ ]

A)0 B) $2x\overline{i}+2y\overline{j}+2z\overline{k}$ C)$\overline{i}+\overline{j}+\overline{k}$ D) 3

19. The grad f of the function f=xyz at (3,3,3) [ ]

A)$\overline{i}+\overline{j}+\overline{k}$ B) $4\overline{i}+4\overline{j}+4\overline{k}$ C) $9\overline{i}+9\overline{j}+9\overline{k}$ D) 0

20. If $\overline{f}=x(y+z)\overline{i}+y(z+x)\overline{j}+z(x+y)\overline{k}$ then div $\overline{f}$ = [ ]

A) $x+y+z$ B) $2(x+y+z)$ C) $3(x+y+z)$ D) 0

21. Physical interpretation of grad(Φ) is that [ ]

A) Max.rate of change B) Min.rate of change C) Max. or Min. D) None

22. If $\overline{r}=y\overline{j}$ then $\nabla.\overline{r}$ is [ ]

A) 0 B) 1 C) 3 D)4

23. The greatest value of directional derivative of function f $=z^3$ at (1,0,-1) [ ]

A) 1 B)2 C) 3 D)4

24. If $\overline{n_1}=2\overline{i}-\overline{j}-\overline{k}$, $\overline{n_2}=4\overline{i}-\overline{j}-4\overline{k}$ and θ is the angle between them, then $\cos\theta=$ [ ]

A) $\frac{13}{\sqrt{198}}$ B) $\frac{-2}{\sqrt{198}}$ C) $\frac{13}{198}$ D) 0

25. If curl $\overline{f}=\overline{0}$ then $\overline{f}$ is [ ]

A) Solenoidal vector B) Irrotational vector C) Free vector D) Scalar

26. If $\Phi = ax^2+by^2+cz^2$ satisfies Laplacian equation, thena+b+c = [ ]

A) 1 B) 2 C) 3 D) 0

27. If $\Phi = x^2 + y^2 + z^2$ then grad Φ = [ ]
A) 0 B) $2x\bar{i} + 2y\bar{j} + 2z\bar{k}$ C) $(y+z)\bar{i} + (z+x)\bar{j} + (x+y)\bar{k}$ D)None

28. If $u = x^2 + y^2 + z^2$ and $\bar{V} = x\bar{i} + y\bar{j} + z\bar{k}$, then $\nabla.(u\bar{V})$ =____ [ ]
A) u B) 2u C) 3u D) 5u

29. If $\bar{r} = z\bar{k}$ then $\nabla.\bar{r}$ is [ ]
A) 0 B) 1 C)3 D) 4

30. The grad f of the function f=xyz at (-1,-1,-1) [ ]
A) $\bar{i} + \bar{j} + \bar{k}$ B) $4\bar{i} + 4\bar{j} + 4\bar{k}$ C) $9\bar{i} + 9\bar{j} + 9\bar{k}$ D) 0

31. Curl $\bar{f}$ is denoted by [ ]
A) $\nabla.\bar{f}$ B) ∇x $\bar{f}$ C) $\nabla + \bar{f}$ D) ∇ - $\bar{f}$

32. The greatest value of directional derivative of function f $= y^2$ at (8,2,-1) [ ]
A) 1 B) 2 C) 3 D) 4

33. If $\bar{a} = -\bar{i} + 2\bar{j} + 3\bar{k}$ then $|\bar{a}|$= [ ]
A) $\sqrt{15}$ B) $\sqrt{14}$ C) $\sqrt{17}$ D) $\sqrt{19}$

34. If $\bar{r} = x\bar{i} + y\bar{j} + z\bar{k}, r = |\bar{r}|$, then $\frac{\partial r}{\partial x}$ = [ ]
A) x B) r C) $\frac{x}{r}$ D) $\frac{r}{x}$

35. If Φ(x,y,z) = c is a surface then grad (Φ) is [ ]
A) Normal to Φ = c B) tangent to Φ = c C) binormal to Φ = c D)None

36. If a=$xy + yz + zx$ then grad a= [ ]
A) 0 B) $2x\bar{i} + 2y\bar{j} + 2z\bar{k}$ C) $(y+z)\bar{i} + (z+x)\bar{j} + (x+y)\bar{k}$ D)None

37. If div$\bar{A}$ = 0 then $\bar{A}$ is called [ ]
A) Solenoidal vector B)Irrotational vector C)free vector D)constant vetor

38. If$\bar{r}$= xi+yj+zk then ∇f(r) = [ ]
A) $\frac{f^1(r)\bar{r}}{r}$ B) $\frac{f^1(r)}{r}$ C) $f^1(r)\bar{r}$ D) $\frac{1}{r}$

39. If$\bar{r}$= xi+yj+zk and if ($r^n\bar{r}$) is solenoidal then n = [ ]
A) 3 B) -3 C) 1 D) -2

40. The greatest value of directional derivative of function f $= y^2 + 5$at (0,2,0) [ ]
A) 1 B) 2 C) 3 D) 4

UNIT-V
VECTOR INTEGRATION

1. For any closed surface S,$\iint_S \; curl\,\bar{F}.\bar{n}ds =$ [ ]
A) 0 B) $2\bar{F}$ C) $\bar{n}$ D) $\oint \bar{F}.\overline{dr}$

2. $\int \bar{r}$x$\bar{n}$dS = [ ]
A) 0 B) 2 C) 3 D)None

3. Given a vector field F, Gauss divergence theorem states that [ ]
A)$\int_v \nabla.\bar{F}dv = \int_s \bar{F}.\bar{n}dS$ B)$\int_s Mdx + Ndy = \iint_R \left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}\right) dxdy$
C)$\int_v \bar{F}.d\bar{r} = \int_s curl\overline{F.ds}$ D)$\iint_s \bar{F}.\bar{n}dS = \iiint_v (\nabla.\bar{F})dv$

4. The value of $\int_c (2xy^2dx + 2x^2ydy + dz)$ along a path c joining $(0,0,0)$ and $(1,1,1)$ is [ ]
   A) 0 B) 2 C) 4 D) 6
5. If $\overline{A}=\nabla\phi$ then the value of $\int_c \overline{A}.d\overline{r}$ where C is $\frac{x^2}{4}+\frac{y^2}{9}=1$ is [ ]
   A) 0 B) 1 C) 9 D) 4
6. $\int f\,\nabla f.\,d\bar{r}$ = [ ]
   A) F B) 2f C) 0 D) None
7. The value of the line integral $\int grad(x+y-z)d\bar{r}$ from (0,1,-1) to (1,2,0) is [ ]
   A) -1 B) 0 C) 2 D) 3
8. If $\int_v[f\nabla^2 g+\nabla f.\nabla g]dV=\int_s(f\nabla g).\bar{n}dS$ is called [ ]
   A) Green's First Identity B) Green's Second Identity
   C) Green's Third Identity D) Green's Fourth Identity
9. If $\bar{r}=x\bar{i}+y\bar{j}+z\bar{k}$, then $\int\bar{r}.d\bar{r}$ = [ ]
   A) I B) $\bar{r}$ C) 0 D) None
10. The grad f of the function f=x-y-z at (0,0,0) [ ]
   A) $\bar{i}+\bar{j}+\bar{k}$ B) $4\bar{i}+4\bar{j}+4\bar{k}$ C) $\bar{i}-\bar{j}-\bar{k}$ D) 0
11. The work done by the force $\bar{F}$ during displacement from P to Q is [ ]
   A) $\int_P^Q div(\bar{F})\ dv$ B) $\int_P^Q \bar{F}\times d\bar{r}$ C) $\int_P^Q \bar{F}.d\bar{r}$ D) $\int_P^Q curl(\bar{F})$
12. $\int r.ndS$ = ----- [ ]
   A) V B) 3V C) 4V D) 5V
13. The value of $\oint f\nabla g.d\bar{r}$ is [ ]
   A) $\int_c \varphi\bar{f}.d\bar{r}-\int_s curl\,(grade\varphi)\times\bar{f}ds$ B) $\int(\nabla f\times\nabla g).\bar{n}ds$
   C) $\int(\nabla f+\nabla g).\bar{n}ds$ D) None
14. $\int \phi\times dV$= [ ]
   A) ϕ B) 0 C) V D) $\oint\bar{n}\emptyset ds$
15. A necessary and sufficient condition that the line integral $\int_c A.dr=0$ for every closed curve c is that [ ]
   A) divA= 0 B) divA≠0 C) curl A=0 D) curlA≠0
16. The condition for Stokes theorem is [ ]
   A) $\int_v\nabla.\bar{F}dv=\int_s\bar{F}.\bar{n}dS$ B) $\int_s Mdx+Ndy=\iint_R\left(\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y}\right)dxdy$
   C) $\oint_c \bar{F}.\overline{dr}=\int_s curl\,\bar{F}.\bar{n}ds$ D) $\iint_s\bar{F}.\bar{n}dS=\iiint_v(\nabla.\bar{F})dv$
17. The value of $\int_s\bar{F}.\bar{n}dS$ where $\bar{F}=x\bar{i}+y\bar{j}+z\bar{k}$ and S is the surface of the sphere $x^2+y^2+z^2=16$ is---- [ ]
   A) 64 B) 256π C) 60π D) 62π
18. Using the divergence theorem, the value of $\iint_S \nabla(x^2+y^2+z^2)\ dS$, where S is a closed surface enclosing volume V. [ ]
   A) V B) 3V C) 4V D) 6V
19. $\int_v\bar{\nabla}\times\bar{F}dv$ = [ ]
   A) $\int_s\bar{n}\times\bar{F}ds$ B) $\int_v\bar{F}dv$ C) $\int_s\bar{n}\,\varphi dS$ D) None
20. If $\bar{F}=(x^2-y^2)\bar{\imath}+xy\bar{\jmath}$ and curve C is the arc of the curve $y=x^3$ from $(0,0)$ to $(2,8)$ then the value of $\int_C \bar{F}.d\bar{r}$ [ ]
   A) 824 B) 824/21 C) 21/824 D) 0

21. Gauss divergence theorem connects [ ]
A) line integral and a surface integral
B)A surface integral and a volume integral
C) A line integral and a volume integral
D) Gradient of a function and its surface integral

22. The grad f of the function f=xyz at (-1,-1,-1) [ ]
A)$\bar{i}+\bar{j}+\bar{k}$ B) $4\bar{i}+4\bar{j}+4\bar{k}$ C) $9\bar{i}+9\bar{j}+9\bar{k}$ D) 0

23. $\int_v \nabla\varphi dv =$ [ ]
A)$\int_v \bar{n}\times\bar{F}ds$ B)$\int_v \bar{F}dv$ C) $\int_s \bar{n}\,\varphi$dS D) None

24. If $\bar{F}=(2x^2-3z)\bar{i}-2xy\bar{j}-4x\bar{k}$then $\nabla.\bar{F}$= [ ]
A) 0 B) x C) 2x D) 4x

25. The condition for Greens theorem is [ ]
A)$\int_v \nabla.\bar{F}dv=\int_s \bar{F}.\bar{n}dS$ B) $\oint_c M\,dx+Ndy=\iint_R\left(\frac{\partial N}{\partial X}-\frac{\partial M}{\partial Y}\right)dxdy$
C)$\int_v \bar{F}.d\bar{r}=\int_s \overline{curl F.ds}$ D)$\iint_s \bar{F}.\bar{n}dS=\iiint_v(\nabla.\bar{F})dv$

26. Gauss divergence theorem is useful only for ___________ surface [ ]
A) Open B) closed C) Bounded D) Zero

27. If ā, b̄ are two sides of a triangle, then the area of the triangle is [ ]
A) $\bar{a}\times\bar{b}$ B) $|\bar{a}\times\bar{b}|$ C) $\frac{1}{2}|\bar{a}\times\bar{b}|$ D) $2|\bar{a}\times\bar{b}|$

28. If $\nabla\times\bar{F}=0$then $\bar{F}$ is called [ ]
A) Solenoidal vector B) Irrotaional vector C) Free vector D) scalar

29. Gradient of a scalar variable is always [ ]
A) A vector B) A scalar C) A dot product D) 0

30. If $\bar{F}=(2x^2-3z)\bar{i}$then $\nabla.\bar{F}$= [ ]
A) 0 B) x C) 2x D) 4x

31. Green's theorem is used to [ ]
A) Transform the line integral in a plane to a surface integral on the same plane
B) Transform double integral into triple integral
C) Transform surface integral into volume integral
D) None of these

32. If $\int_v[f\nabla^2 g-g\nabla^2 f]dV=\int_s(f\nabla g-g\nabla f).\bar{n}dS$is called [ ]
A) Green's First Identity B) Green's Second Identity
C)Green's Third Identity D)Green's Fourth Identity

33. Curl grad φ = [ ]
A)$\bar{1}$ B)$\bar{4}$ C)$\bar{2}$ D) $\bar{0}$

34. If $\bar{F}=2xy\bar{j}$then $\nabla.\bar{F}$= [ ]
A) 0 B) x C) 2x D) 4x

35. Unit normal vector is denoted by [ ]
A)$\bar{n}$ B)$\bar{a}$ C)$\bar{b}$ D) 0

36. Conservative force field is also known as [ ]
A) Solenoidal vector B) Irrotaional vector C) Free vector D) scalar

37. The value of$\int_s \varphi curl\bar{f}.dS$ is [ ]
A)$\int_c \varphi\bar{f}.d\bar{r}-\int_s curl\,(grade\varphi)\times\bar{f}ds$ B)$\int(\nabla f\times\nabla g).\bar{n}ds$
C)$\int(\nabla f+\nabla g).\bar{n}ds$ D) None

38. If S is any closed surface enclosing a volume V and $\bar{F}=x\bar{i}+2y\bar{j}+3z\bar{k}$ then$\iint_s \bar{F}.\bar{n}dS$= --- [ ]
A) V B)3V C) 6V D)8V

39. If $\nabla \times \overline{F} = 0$ then $\overline{F}$ is called [ ]

A) Magnetic force field B) Conservative force field

C) Electromagnetic force field D) None

40. Stokes theorem connects [ ]

A) A line integral and a surface integral B)A surface integral and a volume integral

C) A line integral and a volume integral D) Gradient of a function and its surface integral