Unit-1

1 The differential equation $N\,dx + M\,dy = 0$ will be an exact differential equation if

(a) $\frac{\partial M}{\partial x} = \frac{\partial N}{\partial y}$ (b) $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$ (c) $\frac{\partial N}{\partial x} = -\frac{\partial M}{\partial y}$ (d) $\frac{\partial M}{\partial x} = -\frac{\partial N}{\partial y}$

2 $\int_{y-const} M\,dx + \int (terms\ of\ N\ not\ containig\ x)\,dy = c$ will be the solution of the differential equation $M\,dx + N\,dy = 0$ if

(a) $\frac{\partial M}{\partial x} = \frac{\partial N}{\partial y}$ (b) $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$ (c) $\frac{\partial N}{\partial x} = -\frac{\partial M}{\partial y}$ (d) $\frac{\partial M}{\partial x} = -\frac{\partial N}{\partial y}$

3 The number of integrating factors of the equation $M\,dx + N\,dy = 0\ \ is\,..?$

(a) one (b) Finite (c) infinite (d) none of these

4 The integrating factor of the differential equation $xdy + ydx = x^3y^6dy\ is.$

(a) $\frac{1}{(xy)^3}$ (b) $\frac{1}{(xy)^6}$ (c) $\frac{1}{(xy)^2}$ (d) $\frac{1}{xy}$

5 The integrating factor of the differential equation $xdy + ydx = x^3y^6dx\ is.$

(a) $\frac{1}{(xy)^3}$ (b) $\frac{1}{(xy)^6}$ (c) $\frac{1}{(xy)^2}$ (d) $\frac{1}{xy}$

6 The integrating factor of the differential equation $xdy - ydx = x^2y^6dy\ is.$

(a) $\frac{1}{(y)^3}$ (b) $\frac{1}{(x)^6}$ (c) $\frac{1}{(x)^2}$ (d) $\frac{1}{xy}$

7 The integrating factor of the differential equation $xdy - ydx = x^3y^2dx\ is.$

(a) $\frac{1}{(y)^3}$ (b) $\frac{1}{(x)^6}$ (c) $\frac{1}{(y)^2}$ (d) $\frac{1}{xy}$

8 The integrating factor of the differential equation $y\,dx - xdy + lodx\,dx = 0\ is.?$

(a) $\frac{1}{(y)^3}$ (b) $\frac{1}{(x)^6}$ (c) $\frac{1}{(x)^2}$ (d) $\frac{1}{xy}$

9 The integrating factor of the differential equation $y\,dx - xdy + lody\,dy = 0\ is.?$

(a) $\frac{1}{(y)^2}$ (b) $\frac{1}{(x)^6}$ (c) $\frac{1}{(x)^2}$ (d) $\frac{1}{xy}$

10 The integrating factor of the differential equation $x^2y\,dx - (x^3 + y^3)dy$=0 is

(a) $\frac{-1}{(y)^4}$ (b) $\frac{-1}{(y)^6}$ (c) $\frac{1}{(y)^2}$ (d) $\frac{1}{xy}$

11 The integrating factor of the differential equation $(x^2y - 2xy^2)dx - (x^3 - 3x^2y)dy = 0, is$

(a) $\frac{1}{2(xy)^3}$ (b) $\frac{-1}{(xy)^6}$ (c) $\frac{1}{(xy)^2}$ (d) $\frac{1}{2xy}$

12 The solution of the differential equation $(x^2 - y)dx = (x - y^2)dy\ will\ be\,.?$

(a) $x^3 + y^3 - 3xy = c$ (b) $x^3 + y^3 + 3xy = c$ (c) $x^3 - y^3 - 3xy = c$ (d) $x^3 + y^3 - xy = c$

13 The solution of the differential equation $ye^{xy}dx + (xe^{xy} + 2y)dy = 0\ \ is\,.?$

(a) $e^{xy} + y^2 = c$ (b) $e^{xy} - y^2 = c$ (c) $e^{xy} + y = c$ (d) $e^{xy} - y = c$

14 The integrating factor of the differential equation $(2 + x^2y^2)y\,dx + (2 - x^2y^2)xdy = 0\ is.$

(a) $\frac{1}{2(xy)^3}$ (b) $\frac{-1}{(xy)^6}$ (c) $\frac{-1}{2(xy)^2}$ (d) $\frac{1}{2xy}$

15 The integrating factor of the differential equation $(1 + xy)ydx + (1 - xy)xdy = 0\ is$

(a) $\frac{1}{2(xy)^3}$ (b) $\frac{-1}{(xy)^6}$ (c) $\frac{1}{2(xy)^2}$ (d) $\frac{1}{2xy}$

16 The integrating factor of the differential equation $(1 + x^2 + y^2)dx - 2xydy = 0\ is$

(a) $\frac{-1}{x}$ (b) $\frac{-2}{x}$ (c) $\frac{1}{(x)^2}$ (d) $\frac{-1}{2x}$

17 The integrating factor of the differential $(y^4 + 2y)dx + (xy^3 + 2y^4 - 4x)dy = 0\ is$

(a) $\frac{-1}{y}$ (b) $\frac{-3}{y}$ (c) $\frac{1}{(y)^3}$ (d) $\frac{-1}{2x}$

18 The integrating factor of the differential$(4xy + 3y^2 - x)dx + (2xy + x^2)dy = 0\ is$

(a) $\frac{1}{(y)^2}$ (b) y^2 (c) $\frac{1}{(x)^2}$ (d) x^2

19 If $\frac{1}{x^2y^2}$ is the integrating factor of the differential equation $(4xy+3y^2-x)dx+(2xy+x^2)dy=0$, then its solution is?

(a) $xy^{-1}-2logx+3logy=c$ (b) $xy^{-1}-2logx-3logy=c$ (c) $xy^{-1}-2logx=c$ (d) None of these

20 if $\frac{1}{2(xy)^2}$ is the integrating factor of the differential equation $(1+xy)ydx+(1-xy)xdy=0$,

Then its solution will be?

(a) $\log\left(\frac{x}{y}\right)-\frac{1}{xy}=c$ (b) $\log\left(\frac{x}{y}\right)+\frac{1}{xy}=c$ (c) $\log\left(\frac{x}{y}\right)-\frac{1}{x}=c$ (d) $\log\left(\frac{x}{y}\right)+\frac{1}{x}=c$

21 If e^x is the integrating factor of the differential equation $(x^2+y^2+2x)dx+2ydy=0, \mathit{then\ the\ solution\ is}$

(a) $(x^2+y^2)e^x=c$ (b) $(x^2+2y^2)e^x=c$ (c) $(2x^2+y^2)e^x=c$ (d) $(y^2)e^x=c$

22 The solution of the differential equation $y=px+\sin^{-1}p$ is

(a) $y=\sin^{-1}c$ (b) $y=cx+\sin^{-1}c$ (c) $y=cx$ (d) $y=pc+\sin^{-1}p$

23 The solution of the differential equation $xp^2-yp+a=0\ is$

(a) $y=xc+a/c$ (b) $y=xc+a$ (c) $y=xc+1/c$ (d) $y=x+a/c$

24 The solution of the differential equation $y=px+p^2+p$ is

(a) $y=\mathrm{p}c$ (b) $y=cx+c^2+c$ (c) $y=cx$ (d) $y=pc+c^2+c$

25 the solution of differential equation $xdy-ydx=x^3y^2dx\ is$.

(a) $\frac{x}{y}=-\frac{x^4}{4}+c$ (b) $\frac{x}{y}=\frac{x^4}{4}+c$ (c) $\frac{x}{y}=\frac{x^3}{4}+c$ (d) none of these

26 the solution of differential equation $py-x=0\ is$.

(a) $x^2+y^2=c$ (b) $x^2-y^2=c$ (c) $x^2y^2=c$ (d) $x^2/y^2=c$

1 If e^x , e^{4x} are the solution of differential equation of the form $y'' + a(x)y' + b(x)y = 0$
Then the value of $a(x)$ and $b(x)$ is
(a) $a(x) = -5$ and $b(x) = 4$ (b) $a(x) = 5$ and $b(x) = 4$ (c) $a(x) = -5$ and $b(x) - 4$ (d) $a(x) = 5$ and $b(x) = -4$

2 For the given differential equation $x^2y'' + xy' = 0$ which of the following is not true
(a) Wronskian of fundamental solutions of given differential equation is zero.
(b) Given differential equation is normal on $(-\infty,0)$.
(c) $1, x^2$ forms a basis for the solution set of given differential equation.
(d) Given differential equation is normal on $(0,\infty)$.

3 $(D^4 - D^2)\sin(2x) =$?
(A) $20\sin(2x) + 20\cos(2x)$ (B) $20\cos(2x)$, (C) $20\sin(2x)$, (D) None of these

4 On which interval the given differential equation $x(1-x)y'' - 3xy' - y = 0$ is normal
(a) $(-\infty, 0)$ (b) $(0,1)$ (c) $(1,\infty)$ (d) All of above

5 The roots of the auxiliary equation of $y'' + 5y' + 4y = 18e^{2x}$ are
(a) $-1, 4$, (b) $-1, -4$, (c) $1, -4$, (d) $1, 4$

6 $1 + e^x + e^{-2x}$ is the particular solution of the LDE

(a) $y''' + 3y'' + 6y = 0$ (b) $y''' + y'' - 2y' = 0$ (c) $y''' - 2y = 0$ (d) $y''' + y' - 2y = 0$

7 The Linear differential equation for the solutions e^{2x}, e^{-2x} is

(a) $y'' + 4y = 0$ (b) $y'' - 5y' + 4y = 0$ (c) $4y'' - 2y' + y = 0$ (d) $y'' - 4y = 0$

8 General solution of $Y''' + \pi^2 y' = 0$, $y(0) = 0$, $y(1) = 0$, $y'(0) + y'(1) = 0$

(a) $A\sin\pi x$, A is arbitrary (b) $2\sin\pi x + 3\cos\pi x$ (c) $2\sin\pi x - 3\cos\pi x$ (d) $A\sin\pi x + 3\cos\pi x$

9 General solution of the LDE $y''' - 9y' = 0$ is
(a) $Ae^{-3x} + Be^{3x} + Ce^{2x}$ (b) $Ae^{-5x} + Be$ (c) $Ae^{3x} + Be^{-5x} + Ce^{-2x}$ (d) $A + Be^{3x} + Ce^{-3x}$

10 Which set of functions which is not linearly independent is

(a) x^2, $4x^3$ (b.) $2x$, $6x+3$, $3x+2$ (c) e^x, e^{2x} (d) x^2, $3x^2$

11 The Differential equation $x^2y'' + \sqrt{x}y' + (1-x^2)y = 0$ is normal in the interval

(a) $(1, \infty)$ (b) $(-\infty, 0)$, $(0, \infty)$ (c) $(-\infty, -1)$, $(-1, 1)$, $(1, \infty)$ (d) $(-\infty, 1)$, $(1, \infty)$

12 The complementary function of the LDE $9y''' + 3y'' - 5y' + y = 0$

(a) $Ae^{-x} + (Bx + C)e^{x/3}$ (b) $(A+Bx)e^{-x} + Ce^{-x/3}$ (c) $Ae^{-x} + Be^{-x/3} + Cx$ (d) $Ae^{-x} + Be^{x/3} + Ce^{-x/3}$

13 The Wronskian of the functions 1, cosx, sinx is

(a) 1 (b.)0 (c).2 (d)e^x

14 Which of the following differential equation has y = $e^{-x}(c_1 cos\sqrt{3x} + c_2 sin\sqrt{3x})$+$c_3 e^{2x}$as a general solution

(a) $y''' + 4y = 0$ (b) $y''' - 8y = 0$ (c) $y''' + 8y = 0$ (d) $y''' - 2y'' + y' - 2y = 0$

15 The displacement x(t) of a particle is governed by the differential equation $\ddot{x} + \dot{x} + bx = c\dot{x}$, $b >$ 0 then What should be the relation between b and c so that motion of the particle become oscillatory

(a)$|1 - c| > 2\sqrt{b}$ (b)$|1 - c| < 2\sqrt{b}$ (c) $|1 - c| = 2\sqrt{b}$ (d)None of above

16 The non- trivial solution of the boundary value problem $y'' + w^2 y = 0$ satisfing the conditions $y(0) = 0$ and $y(\pi) = 0$ and for any integer n is given by

(a) $y = a\cos nx$ (b) $y = a\sin nx$ (c) $y = a\cos nx + b\sin nx$ (d) 0

17 The set of linearly independent solutions of the differential equation $y^{iv} + y''' + 14y'' + 16y' - 32y = 0$

(a)$\{e^x, e^{-2x}, \sin 4x\ , \cos 4x\}$ (b)$\{xe^x, e^{-2x}, \sin 4x\ , \cos 4x\}$ (c)$\{xe^{-2x}, \sin 4x\ , \cos 4x\}$
(d)$\{e^x, e^{-2x}, x\sin 4x\ , x\cos 4x\}$

UNIT 3

1 The particular integral of $y' + y = \cosh 3x$ is

(a) $\frac{1}{8}[e^{3x} - e^{-3x}]$ (b) $\frac{1}{8}[e^{3x} - 2e^{-3x}]$ (c) $\frac{1}{8}[2e^{3x} - e^{-3x}]$ (d) none of above

2 The particular integral of $(D^2 + a^2)y = \sin ax$ is

(a) $\frac{-x}{2a}$ cos ax (b) $\frac{-x}{2a}\cos ax$ (c) $\frac{-ax}{2} cosax$ (d) $\frac{ax}{2} cosax$

3 Method to evaluate Particular Integral for $\frac{1}{f(D^2)}\cos ax$ is

(a) Put $D^2 = a^2$, provided f(a) ≠ 0(b)Put D = a, provided f(a) ≠ 0

(c)Put $D^2 = -a^2$, provided $f(-a^2) \neq 0$ (d)Put $D = a^2$, provided f(a) ≠ 0

4 In Method of Variation of Parameters the value of parameters A(x) and B(x) is given as

(a) $A(x) = \int \frac{g(x)y_1(x)}{W}dx \quad B(x) = \int \frac{g(x)y_2(x)}{W}dx$

(b) $A(x) = \int \frac{g(x)y_2(x)}{W}dx \quad B(x) = \int \frac{g(x)y_1(x)}{W}dx$

$(c) A(x) = -\int \frac{g(x)y_1(x)}{W}dx \quad B(x) = \int \frac{g(x)y_2(x)}{W}dx$

$(d) A(x) = -\int \frac{g(x)y_2(x)}{W}dx \quad B(x) = \int \frac{g(x)y_1(x)}{W}dx$

5 The auxiliary equation for the LDE $x^2y'' + 2xy' - 2y = 0$ is

(a) $2m^2 + m - 6 = 0$ (b) $4m^2 + m + 6 = 0$ (c) $m^2 + m - 2 = 0$ (d) $2m^2 - m - 6 = 0$

6 Eliminating one of the variable y_2 from the simultaneous LDEs $y_1' + y_1 + 3y_2 = 4e^{-t}$; $y_2' + 4y_1 - 3y_2 = 8t$ the corresponding LDE formed is

(a) $(D^2-2D - 15)y_1 = -7e^{-t} - 24t$ (b) $(D^2+2D + 15)y_1 = -7e^{-t} - 24t$

(c) $(D^2+2D - 15)y_1 = 7e^{-t} - 24t$ (d) $(D^2-2D +15)y_1 = 7e^{-t} - 24t$

7 Solving by variation of parameter for the equation y'' + y = sec x, the value of Wronskian is

(a) 1 (b) 2 (c) 3 (d) 4

8 The particular integral of differential equation(x > 0) $x^3 y''' + 5x^2y'' + 5x y' + y = x^2$ Using the transformation $x = e^t$, we get (in operator notation) $[\theta^3 + 2\theta^2 + 2\theta + 1]y = e^{2t}$ is

(a) $\frac{1}{21} e^{2t}$ (b) $\frac{1}{31} e^{-2t}$ (c) $-\frac{1}{51} e^{2t}$ (d) $\frac{1}{21} e^{7t}$

9 Particular Integral of the LDE $9y''+ 6y'+ y = e^{-x/3}$ is

$(a) \frac{x^2}{18} e^{-x/3}$ $(b) \frac{x^2}{28} e^{x/3}$ $(c) \frac{x^2}{13}$ $(d) \frac{x^2}{17} e^{-x/3}$

10 Particular integral of $y'' + y' = x^2 + 2x + 4$

(a) $\frac{x^2}{3} + 4x$ (b) $\frac{x^3}{3} + 4$ (c) $\frac{x^3}{3} + 4x$ (d) $\frac{x^3}{3} + 4x^2$

11 By the method of undetermined coefficients the trial solution for y_p for the differential equation $y'' + 2y' + y = 6e^{-x}$is of the form

(a) Ae^{-x} (b) Bxe^{-x} (c) Cx^2e^{-x} (d) None of these

12 For a given system of linear differential equation$y_1{}' = 2y_1 + y_2 , y_2{}' = y_1 + 2y_2$, the second order linear differential satisfied by the y_1 is

(a) $y_1'' + 4y_1' + 3y_1 = 0$ (b) $y_1'' - 4y_1' + 3y_1 = 0$ (c) $y_1'' - 4y_1' - 3y_1 = 0$ (d)none of these

13 Which suitable transformation of independent variable should be used to covert the given differential equation $(x+2)^3y''' + (x+2)^2y'' + (x+2)y' - y = 24x^2$ into a linear differential equation with constant coefficients?

(a) $x = e^t$ (b) $x = \log t$ (c) $x = (e^t - 2)$ (d) None of these

14 The solution of differential equation $x^2y'' - xy' + 2y = 6$ which satisfies the given conditions $y(1) = 1 , y'(1) = 2$.

(a)$y = x[2\sin(\ln x) - 3\cos(\ln x)] + 3$ (b) $y = x[4\sin(\ln x) - 2\cos(\ln x)] + 3$ (c) $y = x[4\sin(\ln x) - 3\cos(\ln x)] + 3$ (d)$y = x[2\sin(\ln x) - \cos(\ln x)] + 3$a

15 If $D = \frac{d}{dx}$, then $\frac{1}{(x^2D^2+2)}16x^3$ is equal

(A)$\frac{1}{2}x^3$ (B) $2x^3$ (C)$\frac{1}{4}(\log x)^3$ (D)$\frac{1}{4}x^3$

16 The solution of differential equation $2x^2y'' + 3xy' - y = x$ which satisfies the given conditions $y(1) = 1 , y(4) = \frac{41}{16}$ is

(A)$y = \frac{1}{4}\left(\sqrt{x} + \frac{1}{x}\right) + \frac{x}{2}$ (B) $y = \frac{1}{4}\left(\sqrt{x} + \frac{1}{\sqrt{x}}\right) + \frac{x}{2}$ (C) $y = \frac{1}{4}\left(\sqrt{x} + \frac{1}{x}\right) + \frac{x^2}{2}$ (D)None of these

17 The resultant second order differential equation in terms of y_2 for the two system of first order differential equations

$y_1' + 2y_2 - 2y_1 - y_2 = e^{2t}$, $y_2' + y_1 - 2y_2 = 0$, is

(a)$y_2'' - 6y_2' + 5y_2 = -e^{2t}$ (b)$y_2'' + 6y_2' + 5y_2 = -e^{2t}$ (c)$y_2'' - 6y_2' + 5y_2 = e^{2t}$ (d) $y_2'' + 6y_2' + 5y_2 = e^{2t}$

18 The particular integral of the differential equation $(D^3 - D)y = e^x + e^{-x}$

(a)$\frac{e^x+e^{-x}}{2}$ (b) $x\left(\frac{e^x+e^{-x}}{2}\right)$ (c)$x^2\left(\frac{e^x+e^{-x}}{2}\right)$ (d) $x^2\left(\frac{e^x-e^{-x}}{2}\right)$

Unit-5

1 The parametric representation of the cylinder $x^2 + y^2 = a^2$is
(a) $r(u,v) = a\cos u\, i + asinu\, j + v\, k$ (b) $r(u,v) = a\cos u\, i + asinu\, j + \, k$
(c) $r(u,v) = \cos u\, i + sinu\, j + \, k$ (d) $r(u,v) = a\cos u\, i + asinu\, j + \, uk$

2 The parametric representation of the paraboloid of revolution $x^2 + y^2 = z$ is
(a) $r(u,v) = u\cos v\, i + usinv\, j + \, u^2 k$ (b) $r(u,v) = a\cos u\, i + asinu\, j + u\, k$
(c) $r(u,v) = \mathrm{v}\cos u\, i + vsinu\, j + v\, k$ (d) $r(u,v) = v\cos u\, i + vsinu\, j + \, uk$

3 The parametric representation of the cone of revolution $x^2 + y^2 = z^2$ is?
(a) $r(u,v) = u\cos v\, i + usinv\, j + \, uk$ (b) $r(u,v) = a\cos u\, i + asinu\, j + u\, k$
(c) $r(u,v) = \mathrm{v}\cos u\, i + vsinu\, j + u\, k$ (d) $r(u,v) = v\cos u\, i + vsinu\, j + \, uk$

4 The parametric representation of the helix is ?
(a) $r(t) = a\cos t\, i + a\, sint\, j + ct\, k$ (b) $r(t) = a\cos t\, i + asint\, j + \, k$
(c) $r(t) = \cos t\, i + sinu\, t + \, k$ (d) $r(t) = a\cos t\, i + asint\, j + \, tk$

5 If r(t) denotes the position vector of a point P on the curve C, then the tangent vector to curve C at P is given by?
(a) $r^{/}(t)$ (b) $r^{//}(t)$ (c) $r\ \ (t)$ (d) none of these

6 If r(t) denotes the position vector of a point P on the curve C, then the unit tangent vector to curve C at P Is given by?
(a) $\frac{r^{/}(t)}{|r^{/}(t)|}$ (b) $\frac{r^{//}(t)}{|r^{/}(t)|}$ (c) $\frac{r^{//}(t)}{|r(t)|}$ (d) $\frac{r^{//}(t)}{|r^{//}(t)|}$

7 If V(t) is the vector function then [$V(t) \times V^{/}(t)]^{/}$ =?
(a) $V(t) \times V^{//}(t)$ (b) $V(t) \times V^{/}(t)$ (c) $V^{/}(t) \times V^{/}(t)$ (d) none

8 The length of the curve $r(t) = \cos t\, i + \, sint\, j + t\, k, 0 \le t \le 2\pi\ is$
(a) $2\sqrt{2}\pi$ (b) $\sqrt{2}\pi$ (c) $3\sqrt{2}\pi$ (d) $5\sqrt{2}\pi$

9 The parametric representation of the curve $x = y, y = z\ is$
(a) $r(t) = t(i + j + k)$ (b) $r(t) = (i + j + k)$ (c) $r(t) = t(i - j + k)$ (d) $r(t) = 2t(i + j + k)$

10 If $r(t) = x(t)i + y(t)j + z(t)k$,then the norm of r(t) is equal to
(a) $[x(t)^2 + y(t)^2 + z(t)^2\ ]^{1/2}$ (b) $[x(t)\ \ + y(t)\ \ + z(t)\ \ ]^{1/2}$
(c) $[x(t)^2 + y(t)^2 + z(t)^2\ ]^2$ (d) $[x(t)^2 + y(t)^2 + z(t)^2\ ]$

11 The length of the curve $r(t) = 2\cos t\, i + 2\, sint\, j,$ $0 \le t \le 2\pi\ is$
(a) 4π (b) 2π (c) π (d) 3π

12 The length of the curve $r(t) = \cos t\, i + \, sint\, j + 3t\, k, 0 \le t \le 2\pi$
(a) $4\pi\sqrt{10}$ (b) $2\pi\sqrt{10}$ (c) $\pi\sqrt{10}$ (d) $3\pi\sqrt{10}$

13 The gradient of a scalar field f(x,y,z) produces a……………?

(a) Vector field (b) Scalar Field (c) surface (d) none

14 If $r = xi + yj + zk, then\ the\ grad \left(\frac{1}{r}\right) = ?$

(a) $-\frac{\vec{r}}{r^3}$ (b) $\frac{\vec{r}}{r^3}$ (c) $-\frac{\vec{r}}{r}$ (d) $-2\frac{\vec{r}}{r^3}$

15 The vector normal to the surface $f(x, y, z) = c$ at the point P is given by ?

(a) $\nabla f(P)$ (b) $\nabla . f(P)$ (c) $\nabla \times f$ (d) none

16 The normal vector to the surface $xy^2 + 2yz = 8$ *at the point* $(3, -2,1)$ *is* ?

(a) $2x - 5j - 2k$ (b) $2x + 5j - 2k$ (c) $2x - 5j + 2k$ (d) $2x + 5j + 2k$

17 The directional derivative of $f(x, y, z)$ in the direction of $\vec{b}$ is ?

(a) $\nabla f . \frac{\vec{b}}{|b|}$ (b) $\nabla f . b$ (c) $\nabla . f$ (d) none

18 The maximum rate of increase of a scalar field $f(x, y, z)$ occure in the direction of the vector…?
(a) ∇f (b) $\nabla . f$ (c) $\nabla \times f$ (d) none

19 The equation of tangent plane to the surface $x^2 - 3y^2 - z^2 = 2$ *at the point* $(3,1,2)$ *is* ?
(a) $3x - 3y - 2z = 2$ (b) $3x - 3y + 2z = 2$ (c) $3x + 3y - 2z = 2$ (d) $3x + 3y + 2z = 2$

20 If ‘f’ is a differentiable scalar field then $\nabla \times \nabla f = ?$
(a) 0 (b) f (c) -f (d) 2f

21 If V is a differentiable vector field then $\nabla . (\nabla \times f) = ?$
(a) 0 (b) f (c) -f (d) 2f

22 If V is a differentiable vector field then $\text{curl}(\text{div}(\text{V})) = ?$
(a) 0 (b) 1 (c) -1 (d) not defined

23 A vector field V is said to be rotational if
(a) $\nabla \times V \neq 0$ (b) $\nabla \times V = 0$ (c) $\nabla . V = 0$ (d) None

24 A force field F is said to be conservative if ?
(a) $\nabla \times F \neq 0$ (b) $\nabla \times F = 0$ (c) $\nabla . F = 0$ (d) None

25 If $V = zi + xj + yk$ *then* curl(curl V)=?
(a) 0 (b) 1 (c) -1 (d) none

26 If f,g are scalar function, then $\nabla . (\nabla f \times \nabla g)$ =?
(a) 0 (b) 1 (c) 2 (d) none

27 If $f(x, y, z)$ satisfy the Laplace equation $\nabla^2 f = 0,$ *then* $\nabla f(x, y, z)$ *is a*?
(a) solenoidal (b) Irrotational (c) Both a & b (d) none

28 If **a** is a constant vector and $\boldsymbol{r} = xi + yj + zk$ then which of the following is true?
(a) $\nabla . (a.r) = a$ (b)) $\nabla . (a \times r) = 0$ (c) $\nabla \times (a \times r) = 2a$ (d) All of these

If $f(x, y, z)$ satisfy the Laplace equation $\nabla^2 f = 0,$ *then* $\nabla f(x, y, z)$ *is a*?
(a) solenoidal (b) Irrotational (c) Both a & b (d) none

28 If **a** is a constant vector and $\boldsymbol{r}= xi+yj+zk$ then which of the following is true?

(a) $\nabla.(a.r)=a$ (b)) $\nabla.(a\times r)=0$ (c) $\nabla\times(a\times r)=2a$ (d) All of these

Unit – 6 Line integral

1 $\int_c ds = \cdots \ldots\ldots ?, where\ C\ is\ the\ curve\ x=3\cos t, y=3\sin t, 0\le t\le \pi$

$(a)\ 3\pi$ $(b)\ \pi$ $(c)\ 2\pi$ $(d)\ 3\pi/2$

2 $\int_c (x^2+yz) = \cdots \ldots\ldots ?, where\ C\ is\ the\ curve\ x=t, y=t^2, z=3t, 1\le t\le 2$

(a) 163/4 (b) 163/2 (c) 163 (d) 120

3 $The\ closed\ line\ integral\ \int_C Mdx+Ndy\ over\ the\ curve\ C\ is\ independent\ of\ the\ path\ if\ ?$

(a) $\frac{\partial M}{\partial x}=\frac{\partial N}{\partial y}$ (b) $\frac{\partial M}{\partial y}=\frac{\partial N}{\partial x}$ (c) $\frac{\partial N}{\partial x}=-\frac{\partial M}{\partial y}$ (d) $\frac{\partial M}{\partial x}=-\frac{\partial N}{\partial y}$

(b)

4 $If\ V\ represent\ the\ force\ field\ then\ the\ work\ done\ by\ V\ along\ any\ simple\ closed\ path\ is\ \ldots ?$

$(a)\ 0$ $(b)\ V$ $(c)\ 2V$ $(d)\ none\ of\ these$

5 $\oint_C (x+xy^2)dx+(y+x^2y)dy = \cdots \ldots\ldots..?\ where\ C\ is\ the\ boundary\ of\ the\ region\ bounded\ by\ x = y, x=y^2$

$(a)\ 0$ $(b)\ 21$ $(c)\ 12$ $(d)\ 123$

6 $\oint_C (4xy+x^2)dx+(3y+2x^2)dy = \cdots \ldots\ldots..?\ where\ C\ is\ the\ boundary\ of\ the\ region\ bounded\ by\ x^2 = y, x=y^2$

$(a)\ 0$ $(b)\ 101$ $(c)\ 112$ $(d)\ 123$

7 $\int_c r.dr = \cdots \ldots\ldots ?, where\ C\ is\ the\ circle\ x^2+y^2=a^2, z=0\ and\ r=xi+yj+zk$

(a) 0 (b) 1 (c) -1 (d) 3

8 $\int_c r\times dr = \cdots \ldots\ldots ?, where\ C\ is\ the\ circle\ x^2+y^2=a^2, z=0\ and\ r=xi+yj+zk$

$(a)\ 0$ $(b)\ 1$ $(c)\ -1$ $(d)\ 3$

9 $The\ area\ bounded\ by\ the\ closed\ curve\ x=a\cos t, y=b\sin t, x\ge 0, y\ge 0\ is$

$(a)\ \pi ab/4$ $(b)\ \pi ab$ $(c)\ \pi ab/2$ $(d)\ \pi ab/3$

10 $The\ area\ bounded\ by\ the\ closed\ curve\ x=4\cos t, y=4\sin t, 0\le t\le 2\pi\ \ is$

$(a)\ 16\pi$ $(b)\ 4\pi$ $(c)\ 3\pi/2$ $(d)\ \pi/3$

11 $\oint_C e^x(Siny\ dx+Cos\ y\ dy)=?\ where\ C\ is\ the\ boundary\ of\ the\ circle\ x^2+y^2=a^2$

(a) 0 (b) 4π (c) $\pi/2$ (d) $2\pi/3$

12 $The\ surface\ area\ of\ the\ surface\ z^2 = x^2 + y^2\ , 0 \le z \le 4\ is\ ?$

$(a)\ 16\sqrt{2}\,\pi$ $(b)\ \sqrt{2}\,\pi$ $(c)\ 4\sqrt{2}\,\pi$ $(d)\ 16\,\pi$

13 The surface area of the surface $z^2 + x^2 + y^2 = 16, x \ge 0, y \ge 0, z \ge 0\ is\ ?$

(a) $8\,\pi$ (b) $4\,\pi$ (c) $4\sqrt{2}\,\pi$ (d) $16\,\pi$

14 $\iint_S (yzdydz + zxdzdx + xydxdy) =\ ?: S\ is\ the\ surface\ of\ the\ cube\ with\ edge\ of\ length\ one\ unit$

$(a)\ 0$ $(b)\ 4\pi$ $(c)\ \pi/2$ $(d)\ 2\pi/3$

15 $\iint_S (xdydz + ydzdx + zdxdy) =\ ?: S\ is\ the\ surface\ of\ the\ cube\ with\ edge\ of\ length\ one\ unit$

(a) 3 (b) 4π (c) 0 (d) -3

16 $\iint_S (xdydz + ydzdx + zdxdy) =\ ?: S\ is\ the\ surface\ \ x^2 + y^2 + z^2 = 16$

$(a)\ 256\pi$ $(b)\ 144\pi$ $(c)\ 0$ $(d)\ 32\pi$

17 $\iint_S (dydz + dzdx + dxdy) =\ ?: S\ is\ the\ surface\ \ z^2 + x^2 + y^2 = 16$

(a) 0 (b) 144π (c) 10 (d) 32π

18

$If\ S\ is\ the\ boundary\ of\ a\ closed\ region\ D\ and\ \mathbf{n}\ is\ outward\ unit\ normal\ vector\ drawn\ to\ surface\ S\ and$ $xi + yj + zk\ then\ \iint_S (r.n)dA = ?$ $(V\ is\ the\ volume\ of\ the\ region)$

$(a)\ 3V$ $(b)\ 2V$ $(c)\ V$ $(d)\ V/2$

19 $\iint_S (r.n)dA = ?\ where\ S\ is\ the\ surface\ of\ the\ cube\ 0 \le x \le 1, 0 \le y \le 2,\ 0 \le z \le 3$

(a) 18 (b) 15 (c) 12 (d) 10

20 $\iint_S (r.n)dA = ?\ \ S\ is\ the\ surface\ x^2 + y^2 + z^2 = 9$

$(a)\ 108\pi$ $(b)\ 144\pi$ $(c)\ 0$ $(d)\ 32\pi$

21 If S is the boundary of a closed region D and **n** is outward unit normal vector drawn to surface S and $r = xi + yj + zk, V = 2xi + 3zyj + 2xyzk$ then $\iint_S (curl\,V.n)dA = ?$ (V is the volume of the region)

(a) 0 (b) 2V (c) V (d) V/2

22 $\iint_S (curl\,V.n)dA = ?\ \ where\ S\ is\ the\ surface\ 0 \le x \le 4, 0 \le y \le 2,\ 0 \le z \le 3\ and\ V = xyi + zxj - zk$

(a) 0 (b) 12 (c) 324 (d) 128

23 If S is the boundary of a closed region D and **n** is outward unit normal vector drawn to surface S and $r = xi + yj + zk, \boldsymbol{a}$ *is a constant vector* then $\iint_S (a.n)dA = ?$ (A is the area of the region)

(a) 0 (b) 2A (c) 3A (d) A/2

Unit-4 PDE

1 How many possible solution are there for one dimensional Heat equation?

(a) Three (b) two (c) one (d) none of these

2 How many possible solution are there for wave equation?

(a) Three (b) two (c) one (d) none of these

3 Method of separation of variable to solve the PDE is also known as ?

(a) Fourier Method (b) Picard Method (c) Laplace Method (d) Lagrange's Method

4 Which of the following solution of heat equation is used to solve the problem related to conduction of heat?

(a) $u(x,t) = (A\cos px + B\sin px)e^{-c^2p^2t}$ (b) $u(x,t) = (A\cos px + B\sin px)e^{c^2p^2t}$
(c) $u(x,t) = (A\cos pt + B\sin pt)e^{-c^2p^2t}$ (d) $u(x,t) = (A\cos px + B\sin px)e^{-c^2p^2}$

5 In the steady state condition the two dimensional heat equation become …..?

(a) Laplace equation (b) Lagrange equation (c) Wave equation (d) Not changed

6 The solution of $3\frac{\partial u}{\partial x} + 2\frac{\partial u}{\partial y} = 0, u(x,0) = 4e^{-x}$ *is* ……….?

(a) $4e^{-x+3/2y}$ (b) $4e^{-x-3/2y}$ (c) $4e^{x+3/2y}$ (d) $4e^{-3/2y}$

7 The solution of $\frac{\partial u}{\partial x} = 4\frac{\partial u}{\partial y}, u(0,y) = 8e^{-3y}$ *is* ……….?

(a) $8e^{-(12x+3y)}$ (b)) $8e^{(12x+3y)}$ (c)) $8e^{-(12x-3y)}$ (d)) $8e^{(12x-3y)}$

8 In the equation $\frac{\partial u}{\partial t} = c^2\frac{\partial^2 u}{\partial x^2}, c^2$ *represent* …….?

(a) Diffusivity of material (b) Density of Material (c) Heat capacity of material (d) none of these

9 The general second degree PDE, $A\frac{\partial^2 u}{\partial x^2} + B\frac{\partial^2 u}{\partial x\,\partial y} + C\frac{\partial^2 u}{\partial y^2} + D\frac{\partial u}{\partial x} + E\frac{\partial u}{\partial y} + Fu = 0$ represent a parabolic equation if ?

(a) $B^2 - 4AC = 0$ (b) $B^2 - 4AC > 0$ (c) $B^2 - 4AC < 0$ (d) None

10 The general second degree PDE, $A\frac{\partial^2 u}{\partial x^2}+B\frac{\partial^2 u}{\partial x\,\partial y}+C\frac{\partial^2 u}{\partial y^2}+D\frac{\partial u}{\partial x}+E\frac{\partial u}{\partial y}+Fu=0$ represent a elliptic equation if ?

(a) $B^2-4AC=0$ (b) $B^2-4AC>0$ (c) $B^2-4AC<0$ (d) None

11 The general second degree PDE, $A\frac{\partial^2 u}{\partial x^2}+B\frac{\partial^2 u}{\partial x\,\partial y}+C\frac{\partial^2 u}{\partial y^2}+D\frac{\partial u}{\partial x}+E\frac{\partial u}{\partial y}+Fu=0$ represent Hyperbolic equation if ?

(a) $B^2-4AC=0$ (b) $B^2-4AC>0$ (c) $B^2-4AC<0$ (d) None

12 Which type of The two-dimensional heat equation $\frac{\partial u}{\partial t}=c^2(\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2})$ is ?

(a) Parabolic (b) Elliptic (c) Hyperbolic (d) Non linear

13 Which type of the pd equation $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0$ is ?

(a) Parabolic (b) Elliptic (c) Hyperbolic (d) Non linear

14 Classify the PDE $\frac{\partial^2 u}{\partial x^2}=5\frac{\partial u}{\partial x}+\frac{\partial u}{\partial y}$?

(a) Parabolic (b) Elliptic (c) Hyperbolic (d) Noneof these

15 Classify the PDE $\frac{\partial^2 u}{\partial x^2}+2\frac{\partial^2 u}{\partial x\,\partial y}+3\frac{\partial^2 u}{\partial y^2}-\frac{\partial u}{\partial x}+\frac{\partial u}{\partial y}+3u=0$

(a) Parabolic (b) Elliptic (c) Hyperbolic (d) Noneof these

16 Classify the PDE $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial x\,\partial y}-\frac{\partial^2 u}{\partial y^2}-\frac{\partial u}{\partial x}+\frac{\partial u}{\partial y}+3u=0$

(a) Parabolic (b) Elliptic (c) Hyperbolic (d) Noneof these

17 Which of the following is wave equation ?

(a) $\frac{\partial^2 u}{\partial t^2}=c^2\frac{\partial^2 u}{\partial x^2}$ (b) $\frac{\partial u}{\partial t}=c^2\frac{\partial^2 u}{\partial x^2}$ (c) $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0$ (d) $\frac{\partial u}{\partial t}=c^2(\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2})$

18 Which of the following is the solution of wave equation?

(a) $(c_1e^{px}+c_2e^{-px})(c_3e^{cpt}+c_4e^{-cpt})$ (b) $(c_1\cos px+c_2\sin px)(c_3\cos cpt+c_4\sin cpt)$

(c) $(c_1x+c_2)(c_3t+c_4)$ (d) all of these