Sree Siddaganga College of Arts, Science and Commerce , B.H Road,Tumkur

DEPARTMENT OF MATHEMATICS

Mathematics Question Bank

I BSc II Semester Paper -2.1 Differential Equations

TWO Marks Questions

1) Define 'order' and 'degree' of a differential equation.
2) Form the partial differential equation from the relation $z = axy + b$.
3) Form the partial differential equation by eliminating arbitrary function from $z = f(x^2 - y^2)$.
4) Solve : $y'' - 2y' + y = 0$.
5) Find the particular integral of $(D^2 + 9)y = cos3x$.
6) Solve $\frac{dy}{dx} + y = 2$.
7) Define the order and degree of the Partial differential equation.
8) Find the complementary function of $(D^3 - 4D^2 + 5D - 2)y = 0$.
9) Define linear d.e of order 'n' and Cauchy's Homogeneous d.e of order 'n'.
10) Solve $q = e^{\frac{-p}{\alpha}}$.
11) Solve p^2-5p-6=0
12) Define Wronskian of u and v, which are functions of x. Hence find the Wronskian of x & $\frac{1}{x}$.
13) Define linear d.e of order ' n ' and Cauchy's Homogeneous d.e of order 'n'.
14) Solve p+q=sinx+siny.
15) Solve $p^2q^3 = 1$.
16) Solve : $(D^3 - 8)y = 0$.
17) Find particular integral of $y'' - 2y' + y = x - 1$.
18) Find the integrating factor of $\frac{dy}{dx} + ysecx = tanx$.
19) Solve $p^2 + 5p + 6 = 0$.
20) Find the complimentary function of $x\frac{d^2y}{dx^2} - (2x + 1)\frac{dy}{dx} + (x + 1)y = x^2e^x$.
21) Find the particular integral of $[D - D']^2$z=e^{x+y}.
22) Find the complimentary function of $(D^2 + 4D + 4)y = 0$.
23) Find the particular integral of $(D^2 + 5D + 6)y = e^{-3x}$.
24) Solve $\sqrt{p} + \sqrt{q} = 1$.
25) Verify for the exactness $(e^y + 1)cosxdx + e^y sinxdy = 0$.
26) Solve $2p^2 + p - 2 = 0$.
27) Solve $(D^3 - 3D^2 + 2D)y = 0$.
28) Find the particular integral of $(D^3 + 1)y = x^4 + 2x$.

29) Find the complimentary function of the differential equation $(D^2 + 2D + 1)y = 0$.

30) Solve $(D^2 + DD' - 6(D')^2)Z=0$.

THREE Marks Questions

1) Solve : $\frac{dy}{dx} - \frac{2y}{x} = 2.$

2) Solve : $\frac{d^3y}{dx^3} - 3\frac{d^2y}{dx^2} + 4\frac{dy}{dx} - 2y = e^x.$

3) Solve : $(D^2 - 1)y = 2 + 5x.$

4) Find the part of complementary function of the equation $xy'' - (2x + 1)y' + (x + 1)y = x^2e^x.$

5) Form the partial differential equation of all planes which are at a constant distance 'a' from the origin.

6) Solve $\frac{dy}{dx} + 2\ sinx = ytanx.$

7) Find the Wronskian of e^x, xe^x and e^{-x}.

8) Find the complete solution of $\frac{d^3y}{dx^3} - 5\frac{d^2y}{dx^2} + 7\frac{dy}{dx} - 3y = e^{3x}$.

9) Solve $(x^2D^2 - xD + 2)y = xlogx.$

10) Form the Partial differential equation from $2z = \frac{x^2}{a^2} + \frac{y^2}{b^2}$ by eliminating arbitrary constants a and b.

11) Solve, $(1+x^2)\frac{dy}{dx} + y = \tan^{-1} x.$

12) Solve , $(1+e^{x/y})dx + (1 - \frac{x}{y})\ e^{x/y}dy = 0.$

13) Solve , $\frac{d^3y}{dx^3} + 6\frac{d^2y}{dx^2} + 11\frac{dy}{dx} + 6y = 2e^x$.

14) Form the pde by eliminating arbitrary constants from the relation $z=(x-a)^2+(y-b)^2$.

15) Form the Partial differential equation by eliminating the arbitrary function from xyz $= \varphi(x+y+z)$.

16) Define Clairauts equation and find the G S of $y + p^2 = xp + 1.$

17) Find the orthogonal trajectories of the family of curves $r = e^{a\theta}.$

18) Define wronskian and find the wronskian of $u = sinhx\ and\ v = coshx.$

19) Solve $D^2y = sin3x + e^{4x.}$

20) Verify the condition of integrability of $(yz + 2x)dx + (zx - 2z)\,dy + (xy - 2y)dz = 0.$

21) Solve $\frac{dx}{y^2} = \frac{dy}{x^2} = \frac{dz}{x^2yz^2.}$

22) Solve $p^2 + q^2 = x + y$

23) Solve $z = px + qy + (p^2 + q^2)$

24) Reduce the equation into the linear d.e. , $2\frac{dy}{dx} - ysecx = y^3 tanx.$

25) Find the orthogonal trajectories of the family of curves $x^2 + y^2 = c^2$

26) Define Wronskian and find the Wronskian of $x \; and \; xe^x$.

27) Find the particular integral of $(D^2 - 2D + 4)y = sin^2 x$

28) Solve $\frac{dx}{yz^2} = \frac{dy}{z^2 x} = \frac{dz}{y^2 x}$.

29) Form a partial differential equation from $x^2 + y^2 = (z - c)^2 tan^2 a.$

30) Solve $\sqrt{p} + \sqrt{q} = x + y.$

FIVE Marks Questions

UNIT -1

1) Solve : $sinx \; cosx \; \frac{dy}{dx} = y + sinx.$

2) Solve : $x\frac{dy}{dx} + (1 - x)y = x^2 y^2.$

3) Solve : $(ax + hy + g)dx + (hx + by + f)dy = 0.$

4) Verify the exactness and Solve $(3x^2y^4+2xy)dx+ (2x^3y^3-x^2)dy=0.$

5) Test for exactness and Solve $(4x^3y^3 - 2xy)\,dx + (3x^4y^2 - x^2)dy = 0.$

6) Test for exactness and Solve $(cosy + ycosx)dx+(sinx-xsiny)dy=0.$

7) Verify the exactness and Solve $x^2ydx - (x^3 - y^3)dy = 0.$

8) Solve $(5x^4 + 3x^2y^2 - 2xy^3)dx + (2x^3y - 3x^2y^2 - 5y^4)dy = 0$

9) Solve $(x^2 + y^2 + x)dx + (xy)dy = 0.$

10) Solve by finding an integrating factor $(x^2 + y^2)dx - (xy^3)dy = 0.$

11) Solve $\frac{dy}{dx} - 2ytanx = y^2 tan^2 x.$

12) Solve $x\frac{dy}{dx} = y + x^3 + 3x^2 - x.$

13) Solve $\frac{dy}{dx} - y = xy^5.$

14) Solve the Bernoulli's equation $\frac{dy}{dx} + y = y^2(cosx - sinx).$

15) Find the singular solution of $(px - y)(py + x) = a^2 p$ by using the transformation $x^2 = u \; and \; y^2 = v.$

16) Solve $y - 2px + yp^2$

17) Find the General and singular solution of $y = px + sin^{-1}p.$

18) Find the orthogonal trajectories of the family $r^2 = a^2 cos2\theta.$

19) Find the orthogonal trajectories of the family $ay^2 = x^3.$.

20) Find the orthogonal trajectories of the family of curves $x^2 + y^2 = c^2.$

UNIT -2

1) Solve : $(D^2 - 3D + 2)y = 6e^{3x} + sin2x.$
2) Solve : $\frac{d^2y}{dx^2} - 10\frac{dy}{dx} + 16y = e^{4x}sin2x.$
3) Solve $(D^2\text{-}3D+2)y = 6e^{3x} + \sin 2x.$
4) Solve $y''' + 8y = x^4 + 2x + 1.$
5) Solve : $(D^3 - 2D^2 + D)y = e^{2x} + x^2.$
6) Solve : $(D^3 - 1)y = (e^x + 1)^2.$
7) Solve : $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = cos^2x.$
8) Solve : $(D^2 + 2D + 1)y = x^2 + 1$
9) Solve : $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 4y = e^x cosx.$
10) Prove that the two solutions $y_1(x)\ and\ y_2(x)$ of the equation $a_o y'' + a_1 y' + a_2 y = 0,\ a_o \neq 0, x \in (a, b)$ are linearly dependent if and only if their wronskian is identically Zero.
11) Solve : $(D^3 + 6D^2 + 11D + 6)y = e^x$
12) Solve : $(D^2 - 6D + 9)y = e^{3x}(x^2 + 7x + 5).$
13) Solve : $\frac{d^3y}{dx^3} - 3\frac{d^2y}{dx^2} + 9\frac{dy}{dx} - 27y = cos3x.$
14) Solve $(D^2\text{-}2D+5)y = \sin 3x.$
15) Solve : $(D^2 + 4)y = x^2 + 3.$

UNIT -3

1) Solve : $(1 + x)^2 \frac{d^2y}{dx^2} + (1 + x)\frac{dy}{dx} + y = 4\cos(\log(1 + x)).$
2) Solve $x\frac{dy}{dx} + (1\text{-}x)y = x^2y^2.$
3) Solve $(x^2D^2 - xD + 4)y = \cos(logx).$
4) Solve $(x^3D^3 + 3x^2D^2 - 2xD + 2)y = 0.$
5) Solve $\frac{dy}{dx} + \frac{1}{x}\frac{dy}{dx} = \frac{12logx}{x^2}.$
6) Solve $\frac{d^2y}{dx^2} + \frac{1}{x}\frac{dy}{dx} - \frac{1}{x^2}y = 0$, given that $x + \frac{1}{x}$ is a solution.
7) Solve : $\frac{d^2y}{dx^2} + (2cosx + tanx)\frac{dy}{dx} + ycos^2x = cos^4x$ by change of independent variable.

8) Solve $\frac{d^2y}{dx^2} + y = cosecx$ by the method of parameter.

9) Solve $D^2y + y = secx$ by the method of parameter.

10) Solve $\frac{dx}{y-z} = \frac{dy}{z-x} = \frac{dz}{x-y}$

11) Solve $\frac{dx}{(y-z)x} = \frac{dy}{(z-x)y} = \frac{dz}{(x-y)z}$

12) Solve the system $\frac{dx}{x} = \frac{dy}{(x+z)} = \frac{dz}{(-z)}$.

13) Solve $(x-y)dx - xdy + zdz = 0$.

14) Solve $(y+z)dx + (x+z)dy + (x+y)dz = 0$.

15) Solve $dx + (x+z)dy + dz = 0$.

UNIT -4

1) Form the partial differential equation by eliminating the arbitrary function from the relation $f(x^2 + y^2 + z^2, z^2 - 2xy) = 0$.

2) Form the partial differential equation by eliminating the arbitrary functionfrom the relation $f(x+y+z, x^2 + y^2 - z^2) = 0$.

3) Show that the function $xyz = f(x+y+z)$ has partial differential equation is $x(y-z)p + y(z-x)q = z(x-y)$.

4) Solve completely $x(y-z)p + y(z-x)q = z(x-y)$.

5) Solve $(y^2+z^2)p - xyq + xz = 0$.

6) Solve $p - 2q = 3x^2 \sin(y+2x)$.

7) Solve $q = (z+px)^2$ by charpit's Method.

8) Solve $(p^2+q^2)x = pz$ by charpit's Method.

9) Solve $z = pq$ by charpit's Method.

10) Find the complete integral of $(p^2+q^2)y = qz$ by charpit's Method.

11) Find the complete solution of $(D^2 - DD')z = sinxcos2y$.

12) Solve $[D^2 + 3DD' + 2(D')^2]z = x + y$.

13) Solve $[D^2 - 2DD' + (D')^2]z = e^{x+2y}$.

14) Solve $[D^2 - DD' - 2(D')^2]z = e^x(y-1)$

15) Solve $(p^2 - q^2)z = x - y$.

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