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Department of Mathematics
B.Sc. I (Semester-II)
Differential Equations-II (BMT-202)
Subject Code: 16002

1: Answer in one sentence

1) For the equation $\frac{d^2y}{dx^2}+P\frac{dy}{dx}+Qy=R$, if $P+xQ=0$ then what will be its particular integral?
2) The homogeneous linear differential equation can be reduced to linear equation with constant coefficient by using which substitution?
3) By using substitution $z=logx$ what is the value of $x^2\frac{d^2y}{dx^2}+2x\frac{dy}{dx}$?
4) Write the condition of integrability of the total differential equation

   $Pdx+Qdy+Rdz=0.$
5) In the simultaneous differential equation $\frac{dx}{P}=\frac{dy}{Q}=\frac{dz}{R}$ what will be the P,Q,R?
6) What is the solution of homogeneous linear equation $x^2\frac{d^2y}{dx^2}-x\frac{dy}{dx}-3y=0$?
7) By using substitution $x=e^z$ what is the value of $x^3\frac{d^3y}{dx^3}$?
8) For the equation $\frac{d^2y}{dx^2}+P\frac{dy}{dx}+Qy=0$, if $m^2+mP+Q=0$, then what is its particular integral?
9) Define method of grouping for solving simultaneous equation $\frac{dx}{P}=\frac{dy}{Q}=\frac{dz}{R}$.
10) In the total differential equation $Pdx+Qdy+Rdz=0$, what will be

    P,Q,R?
11) Find the complementary function of the differential equation

    $x^2\frac{d^2y}{dx^2}-4x\frac{dy}{dx}+6y=x.$
12) By using substitution $x=e^z$ what will be the value of $x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}$?
13) In solving $\frac{d^2y}{dx^2}+P\frac{dy}{dx}+Qy=R$ by change of dependent variable method, the complete solution is given by $y=uv$ where u is?
14) If $1-P+Q=0$ then what is the known solution of

    Complementary function of the differential equation $\frac{d^2y}{dx^2}+P\frac{dy}{dx}+Qy=R$?
15) What is the geometrical relation between total differential equation

and simultaneous differential equation?

16) If $1 + P + Q = 0$ then what is the known solution of

Complementary function of the differential equation $\frac{d^2y}{dx^2} + P\frac{dy}{dx} + Qy = R$?

18) If $2 + 2Px + Qx^2 = 0$ then what is the known solution of

Complementary function of the differential equation $\frac{d^2y}{dx^2} + P\frac{dy}{dx} + Qy = R$?

19) If $m(m-1) + mPx + Qx^2 = 0$ then what is the known solution of

complementary function of the differential equation $\frac{d^2y}{dx^2} + P\frac{dy}{dx} + Qy = R$?

20) Find the complementary function of the differential equation
$x^2\frac{d^2y}{dx^2} + 3x\frac{dy}{dx} + y = \frac{1}{x}$.

21) By using substitution $x = e^z$ what is the value of $x^4\frac{d^4y}{dx^4}$?

22) By using substitution $x = e^z$ what is the value of $x^2\frac{d^2y}{dx^2} + 2x\frac{dy}{dx} - 2y$?

23) Find one of the solution of simultaneous differential equation
$\frac{dx}{xz} = \frac{dy}{yz} = \frac{dz}{(x+y)^2}$.

24) Find one of the solution of simultaneous differential equation
$\frac{dx}{z} = \frac{dy}{-z} = \frac{dz}{z^2+(x+y)^2}$.

25) If the condition of integrability is satisfied then what is the solution of the equation $dx + dy + (x+y)dz = 0$.

2. Long answer questions

1) Discuss the method of solving $\frac{d^2y}{dx^2} + P\frac{dy}{dx} + Qy = R$, where P, Q, R are functions of x only, when one solution of $f(D)y = 0$ is known.

2) Explain the method to find the solution of homogeneous linear

differential equation.

3) State and prove the condition of integrability of total differential equation $Pdx + Qdy + Rdz = 0$ (where P, Q, R $are\ functions\ of\ x, y, z$) and hence solve $yzdx + zxdy + xydz = 0$

4) Discuss the method of solving $\frac{d^2y}{dx^2} + P\frac{dy}{dx} + Qy = 0$, where P, Q, R are functions of x only by changing independent variable.

5) Solve $(3x+2)^2\frac{d^2y}{dx^2} + 3(3x+2)\frac{dy}{dx} - 36y = x^2 + x + 1$.

6) Write the geometrical interpretation of $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$ and solve $\frac{dx}{yz} = \frac{dy}{xz} = \frac{dz}{xy}$.

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

8) Discuss the method of solving $\frac{d^2y}{dx^2} + P\frac{dy}{dx} + Qy = R$, where P, Q, R are functions of x only by changing dependent variable.

9) Write the geometrical interpretation of $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$ and solve $\frac{dx}{z} = \frac{dy}{-z} = \frac{dz}{z^2+(x+y)^2}$.

10) Write the geometrical interpretation of $Pdx + Qdy + Rdz = 0$ and solve $2xdx + 2ydy + (x^2 + y^2 + e^z)dz = 0$.

11) Write the geometrical interpretation of $Pdx + Qdy + Rdz = 0$ and solve $(yz + 2x)dx + (zx - 2z)dy + (xy - 2y)dz = 0$.

12) State and prove the condition of integrability of total differential equation $Pdx + Qdy + Rdz = 0$ (where P, Q, R *are functions of* x, y, z) and hence solve $(2x + y^2 + 2xz)dx + 2xydy + x^2dz = 0$.

13) Solve $(x+1)^2\frac{d^2y}{dx^2} + (x+1)\frac{dy}{dx} + y = 4\cos\ log(x+1)$.

14) Solve $(1-x)^2\frac{d^2y}{dx^2} - (1-x)\frac{dy}{dx} + 4y = \sin\ log(1-x)$.

15) State and prove the condition of integrability of total differential equation $Pdx + Qdy + Rdz = 0$ (where P, Q, R *are functions of* x, y, z) and hence solve $(y+z)dx + (z+x)dy + (x+y)dz = 0$.

3. Short answer questions

1) Find the solution of $(x+1)^2\frac{d^2y}{dx^2} + (x+1)\frac{dy}{dx} - y = 2\log(x+1)$.

2) Find the solution of $x^2\frac{d^2y}{dx^2} - 2(x^2+x)\frac{dy}{dx} + (x^2+2x+2)y = 0$ by change of dependent variable.

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

4) Find the solution of $(yz + 2x)dx + (zx - 2z)dy + (xy - 2y)dz = 0$.

5) Find the solution of $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} - 4y = x^2$.

6) Solve $\frac{dx}{xz} = \frac{dy}{yz} = \frac{dz}{(x+y)^2}$.

7) Find the solution of $x^2\frac{d^2y}{dx^2} - 4x\frac{dy}{dx} + 6y = x$.

8) Solve $\frac{dx}{z} = \frac{dy}{-z} = \frac{dz}{z^2+(x+y)^2}$.

9) Solve $2xdx + 2ydy + (x^2 + y^2 + e^z)dz = 0$.

10) Find the solution of $x^2\frac{d^2y}{dx^2} - 2(x^2+x)\frac{dy}{dx} + (x^2+2x+2)y = 0$

11) Solve $\frac{d^2y}{dx^2} - 2tanx\frac{dy}{dx} + 3y = 2secx$, if $y = sinx$ is known solution.

12) Solve $yzdx + zxdy + xydz = 0$.

13) Explain the geometrical relation between total differential equation

and simultaneous differential equation.

14) Solve $\frac{dx}{mz-ny} = \frac{dy}{nx-lz} = \frac{dz}{lx-my}$.

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

16) solve $(x-y)dx - xdy + zdz = 0$.

17) solve $yzdx + 2xzdy - 3xydz = 0$.

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

19) Solve $\frac{dx}{x(y^2-z^2)} = \frac{dy}{-y(z^2+x^2)} = \frac{dz}{z(x^2+y^2)}$

20) Write the geometrical interpretation of $Pdx + Qdy + Rdz = 0$.

21) Write the geometrical interpretation of $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$.

22) Solve $\frac{dx}{y+z} = \frac{dy}{z+x} = \frac{dz}{x+y}$

23) solve $(2x+y^2+2xz)dx + 2xydy + x^2dz = 0$.

24) Find the solution of $x^3\frac{d^2y}{dx^2} - 2x^2\frac{dy}{dx} + 2xy = 1$.

25) Find the solution of $x^2\frac{d^2y}{dx^2} - 3x\frac{dy}{dx} + 4y = 2x^2$.

26) Find the solution of $x\,\frac{d^3y}{dx^3} + \frac{d^2y}{dx^2} = \frac{1}{x}$.

27) Solve $x^2\frac{d^2y}{dx^2} - 2x(1+x)\frac{dy}{dx} + 2(1+x)y = x^3$.

28) Solve $\frac{d^2y}{dx^2} - cotx\frac{dy}{dx} + sin^2xy = cosx - cos^3x$.

29) $x\frac{d^2y}{dx^2} - (4x^2 - 1)\frac{dy}{dx} + 4x^3y = 2x^3$

30) Solve $\frac{xdx}{y^2z} = \frac{dy}{zx} = \frac{dz}{y^2}$