Bachelor of Science (B.Sc.-II) Third Semester Old Course

B.Sc.23112 / MAT-202 - Mathematics Paper-II (Differential Equations)

P. Pages : 2 **GUG/W/18/1271**

Time : Three Hours Max. Marks : 60

Notes : 1. Solve all **five** question.
2. All questions carry equal marks.

UNIT – I

1. a) Solve $\dfrac{dx}{x(y-z)}=\dfrac{dy}{y(z-x)}=\dfrac{dz}{z(-y+x)}$. **6**

b) Solve the PDE. **6**
$x\left(y^2-z^2\right)p+y\left(z^2-x^2\right)q=z\left(x^2-y^2\right)$.

OR

c) Show that the questions $xp-yq=x$ and $x^2p+q=xz$ are compatible and find their solution. **6**

d) Solve by Charpit's method $pxy+pq+qy=yz$. **6**

UNIT – II

2. a) Solve $\left(D^2-2DD'-8D'^2\right)z=\sqrt{2x+3y}$. **6**

b) Find the PI of $\left(D^3+4D^2D'-4DD'^2\right)z=\cos(2x+3y)$. **6**

OR

c) Solve $D(D-2D'-3)z=e^{x+2y}$. **6**

d) Solve the equation. **6**
$$x^2\frac{\partial^2 z}{\partial x^2}-y^2\frac{\partial^2 z}{\partial y^2}-y\frac{\partial z}{\partial y}+x\frac{\partial z}{\partial x}=0.$$

UNIT – III

3. a) If $C_1,C_2,----C_n$ are any constant and $f_1(t),----f_n(t)$ are functions whose Laplace transforms exist, then **6**
Prove that
$L\left[c_1f_1(t)+-----+c_nf_n(t)\right]=c_1L\left[f_1(t)\right]+------+c_nL\left[f_n(t)\right]$.

b) Find **6**
i) $L\left[3t^2-2e^t+\sin h\,3t+5\cos 4t\right]$
ii) $L\left[\sin(\omega t+2)\right]$.

OR

c) Evaluate $\int_0^\infty e^{-2t} \sin^3 t \, dt$. **6**

d) Find the inverse Laplace transform of **6**
$\frac{s^2 - 6}{s^3 + 4s^2 + 3s}$.

UNIT – IV

4. a) Verify the convolution theorem for $f_1(t) = t,\ f_2(t) = \cos ht$. **6**

b) Find the inverse Laplace transform of **6**
$\frac{s^2}{(s^2 + a^2)(s^2 + b^2)}$ by convolution theorem.

OR

c) Find $L\left(\frac{\sin at}{t}\right)$ and hence show that $\int_0^\infty \frac{\sin t}{t} dt = \pi/2$. **6**

b) Solve $\frac{d^2x}{dt^2} - 3\frac{dx}{dt} + 2x = 4t + e^{3t}$, when $x(0) = 1$, and $x'(0) = -1$ by using Laplace transform method. **6**

5. Solve **any six.**

a) Obtain partial differential equation by eliminating the arbitrary constants from the equation $z = ax + by + a^2 + b^2$. **2**

b) Write the condition of compatibility. **2**

c) Solve $(D^3 - 6D^2D' + 11DD'^2 - 6D'^3)z = 0$. **2**

d) Find a surface passing through the two lines $z = x = 0,\ z - 1 = x - y = 0$, satisfying $r - 4s + 4t = 0$. **2**

e) Define Laplace transform. **2**

f) Find L (Cos h at). **2**

g) State convolution theorem. **2**

h) Let u (x, t) be defined for $a \le x \le b, t > 0$, Denote, $U = U(x,s) = L[U]$ then find $L[U_{xx}]$. **2**

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