U.G. 2nd Semester Examination - 2021

MATHEMATICS

[Other Than Mathematics Honours]

Generic Elective (GE)

Course Code : MATH-H-GE-T-02

Full Marks : 30 Time : $1\frac{1}{2}$ Hours

The figures in the right-hand margin indicate marks.

The symbols and notations have their usual meanings.

1. Answer any **five** questions: 2×5=10

a) Find the order and degree of the differential equation

$$\left(1+\frac{d^3y}{dx^3}\right)^{\frac{3}{2}}=5\frac{d^2y}{dx^2}.$$

b) By eliminating constants A and B find the differential equation of the primitive

$y=Ae^x+Be^{-x}$.

c) Solve : $ydx-xdy=xy\,dx$.

d) Verify whether the differential equation

$\left(2x^2+y^2+x\right)dx+xy\,dy=0$ is exact or not.

e) Solve : $2x\left(y+1\right)dx-xdy=0,\ y\left(o\right)=-2$

f) Show that the curve for which normal at any point passes through a fixed point on x-axis, is a circle.

g) Construct a partial differential equation by eliminating a and p from

$z=ae^{-p^2t}\cos px\cdot$

h) Solve : $\frac{dx}{yz}=\frac{dy}{zx}=\frac{dz}{xy}$.

2. Answer any **two** questions: 5×2=10

a) Solve the partial differential equation

$\left(x^2-yz\right)p+\left(y^2-zx\right)q=z^2-xy$.

b) Find a complete integral of $z=px+qy+p^2+q^2$.

c) Solve by the method of variation of parameter

$\frac{d^2y}{dx^2}+16y=\sec 4x$.

d) Solve : $x^3\frac{d^3y}{dx^3}+2x^2\frac{d^2y}{dx^2}+2y=10\left(x+\frac{1}{x}\right)$.

e) Obtain the general and singular solution of the ordinary differential equation

$$y = px - p^2,\ p \equiv \frac{dy}{dx}.$$

3. Answer any **one** question: 10×1=10

a) i) Solve : $x^2(xdx + ydy) + 2y(xdy - ydx) = 0$

ii) Solve : $\frac{d^2y}{dx^2} - y = xe^x \sin x$

b) i) Solve : $\frac{dx}{dt} + \frac{dy}{dt} - 2y = 2\cos t - 7\sin t$

$\frac{dx}{dt} - \frac{dy}{dt} + 2x = 4\cos t - 3\sin t$

ii) Verify the equation

$$(y^2 + z^2 - x^2)dx - 2xy\,dy - 2xz\,dz = 0$$

is integrable and hence solve it.

c) i) Find the integral surface of the partial differential equation

$$(x - y)p + (y - x - z)q = z$$

through the circle $z = 1,\ x^2 + y^2 = 1$.

ii) Solve the partial differential equation

$$xyp + y^2q = zxy - zx^2.$$

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