Model Question Paper

Mathematics (MTH2)

Class – XII

Semester- IV

Full Marks: 40

GROUP – A($5 \times 2 = 10$)

(This group consists of 5 questions with 2 marks each)

1. Find the projection of $\vec{a}$on$\vec{b}$ if $\vec{a}.\vec{b} = 8$and $\vec{b} = 2\hat{\imath} + 6\hat{\jmath} + 3\hat{k}$.
2. Integrate : $\int \frac{dx}{(x^2-x)}$
3. Evaluate :$\int_0^{\frac{\pi}{2}} \sqrt{1 - \cos 2x}$ dx
4. Find the area of the region bounded by the curve $y^2 = 4x$, $y-$ axis and the line y $y = -3$.
5. Find the order and degree of the differential equation:

$$\left(\frac{d^2y}{dx^2}\right)^3 + \left(\frac{dy}{dx}\right)^4 + \sqrt[3]{y} = 0$$

GROUP – B ($5 \times 3 = 15$)

(This group consists of 5 questions with 3 marks each)

6. If $\left|\vec{a} \times \vec{b}\right|^2 + \left|\vec{a}.\vec{b}\right|^2 = 400$ and$|\vec{a}| = 5$; find $\left|\vec{b}\right|$

OR

Using vector method; find the area of the triangle with vertices $A(1, 2, 3)$, $B(2, -1, 4)$and $C(4, 5, -1)$.

7. Integrate : $\int \frac{\mathrm{dx}}{\sin^4 \mathrm{x} + \cos^4 \mathrm{x}}$

OR

Evaluate : $\int_0^{\pi} \frac{\mathrm{x} \sin \mathrm{x}}{1+\cos^2 \mathrm{x}} \mathrm{dx}$

8. Using integrals find the area enclosed between the parabola $x^2 + 8y = 0$ and its latus rectum.

OR

Using integralsfind the area of the region bounded by $y = |x - 1|$ and $y = 1$

9. Solve the equation : $\frac{dy}{dx} - y = e^x$, given $y(0) = 1$

OR

Solve the equation $\left(xe^{\frac{y}{x}} + y\right) dx = x\, dy$, given $y(1) = 1$

10. Using integrals, find the area enclosed by the ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1$.

OR

Using integrals, find the area of the figure $|x| + |y| = 1$.

GROUP – C ($3 \times 5 = 15$)

(This group consists of 3 questions with 5 marks each)

11. Evaluate : $\int \frac{\sin(x-2a)}{\sin(x+2a)}\, dx$

OR

Integrate : $\int_0^{\pi} x \cos^2 x\, dx$

12. Find a unit vector perpendicular to each of the vectors $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ where $a = 3\hat{\imath} + 2\hat{\jmath} + 2\hat{k}$ and $\vec{b} = \hat{\imath} + 2\hat{\jmath} - 2\hat{k}$

13. Find the equation of the curve passing through the point (1,1) whose differential equation is $x\, dy = (2x^2 + 1)dx$.

OR

Find the equation of a curve passing through $\left(1, \frac{\pi}{4}\right)$, if the slope of the tangent to the curve at any point $P(x, y)$ is $\frac{y}{x} - cos^2\left(\frac{y}{x}\right)$
