Code : S 03

Register Number | 3 | 79 | EC | 0 | 40 | 5 | 6 |

Second Semester Diploma (Annual) Examination, 2005

SCIENCE BOARD

APPLIED MATHEMATICS – II

(Course Codes AT, CE, CR, CS, EC, EE, EP, IC, IS, LT, ME, MN, MP, MT, MY, PH, TX, MC, WH, MA)

Time : 3 Hours] [Max. Marks : 100

Note : i) **Section – A** is compulsory.

ii) Answer any *six* questions from **Section – B**.

iii) Answer any *thirteen* questions from **Section – C**.

iv) Answer any *three* questions from **Section – D**.

SECTION – A

I. Fill in the blanks : $5 \times 1 = 5$

1. The slope of straight line perpendicular to $3x + 7y - 1 = 0$ is ..... .

2. The radius of the circle $2x^2 + 2y^2 = 8$ is ..... .

3. $\lim_{\theta \to 0} \frac{\sin 2\theta}{\theta}$ = ...2..... .

4. $\frac{d}{dx}\left(2x^{-3}\right)$ = ...$-6x^{-4}$ or $\frac{-6}{x^4}$..... .

5. $\int_0^{\pi/2} \sin x \, dx$ = ...-1..... .

SECTION – B

II. Answer any *six* questions from the following : $6 \times 2 = 12$

1. Find the locus of a point P such that its distance from a fixed point $(-2, 5)$ is always 4 units.

2. Find the equation to the line passing through the point $(4, 5)$ and having a slope $\frac{3}{2}$.

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3. Find the equation of the circle if the two ends of diameters are (3, – 6) and (– 2, 5).

4. Evaluate $\lim_{x \to -2} \frac{x^7 + 128}{x + 2}$

5. Differentiate w.r.t. x : $\cos^3 x$.

6. If $x = a \cos \theta$, $y = a \sin \theta$, find $\frac{dy}{dx}$.

7. Find the slope of tangent to the curve $y = 2x^2 - 5x + 7$ at the point (2, 5) on it.

8. Integrate w.r.t. x : $x^3 + 3x^2 + 7x - 13$.

9. Form the differential equation by eliminating arbitrary constants if $y = a \cos (\omega t + \alpha)$.

SECTION – C

III. Answer any *thirteen* questions from the following : $13 \times 5 = 65$

1. Show that the points A (7, 9), B (3, – 7) and C (– 3, 3) are the vertices of an isosceles right-angled triangle.

2. Find the equation to the perpendicular bisector of the line joining the points (5, – 7) and (3, 11).

3. Find the equation to a line passing through the point (2, 2) and whose x-intercept is 3 times the y-intercept.

4. Find the equation of the circle passing through the point (– 3, 1) and having its centre at the point (1, – 1).

5. Find the value of λ if the circles $2x^2 + 2y^2 + 4x + 6y + 3 = 0$ and $x^2 + y^2 + \lambda x - 3y + 1 = 0$ cut orthogonally.

6. Evaluate : $\lim_{x \to -1} \frac{x^2 + 4x + 3}{x^2 + 6x + 5}$.

7. Evaluate : $\lim_{\theta \to 0} \frac{\cos \theta - \cos 3\theta}{\theta^2}$.

8. Differentiate w.r.t. x : $e^{\sqrt{x}} \log (\sin x)$.

9. Differentiate w.r.t. x : $\sqrt{\frac{x^2 + 1}{x^2 - 1}}$.

10. If $x = a(\cos\theta + \theta\sin\theta)$, $y = a(\sin\theta - \theta\cos\theta)$, find $\frac{dy}{dx}$ at $\theta = \frac{\pi}{4}$.

11. If $y = ae^{mx} + be^{-mx}$, prove that $\frac{d^2y}{dx^2} - m^2 y = 0$.

12. Find the points on the curve $y = 2x^3 - 3x^2 + 5$ where the tangent is parallel to X-axis.

13. The volume of a sphere is increasing at the rate of 2 c.c./minute. Find the rate of increase of radius when the radius is 15 cm.

14. Integrate $\sin^3 x$ w.r.t. x.

15. Evaluate : $\int (3 + 4\sin x)^{10} \cos x \, dx$.

16. Evaluate : $\int x \cdot \sin 3x \, dx$.

17. Evaluate : $\int_0^{\pi/2} \cos^2 x \, dx$.

18. Find the area bounded by the curve $y = x^2 - 5x + 6$ and the X-axis.

19. Solve : $x\left(y^2 + 1\right) dx + y\left(x^2 + 1\right) dy = 0$.

20. Solve : $\frac{dy}{dx} + y\tan x = \cos x$.

SECTION – D

IV. Answer any *three* questions from the following : $3 \times 6 = 18$

1. In what ratio does the x-axis divide the line joining the points $(-6, 2)$ and $(-7, -8)$. Also find the point of division.

2. Find the equation to the line passing through the point of intersection of the lines $x + 2y + 8 = 0$ and $4x + 3y + 17 = 0$ and perpendicular to the line $x - 5y + 11 = 0$.

3. Differentiate $\sin x$ w.r.t. x from the first principle.

4. $\int \left(3x^4 + \frac{1}{\sqrt{1 - x^2}} + e^{2x} + \sin 2x + 3\,\text{cosec}\, x \cot x + \frac{2}{x} \right) dx$.

5. Find the volume of sphere by integration method.