

DAE/IIA - 2018/02 SECOND YEAR

(Common with Architecture, Automation, Auto-Mobile & Diesel,
Auto & Farm Machinery, Civil, Cast Metal & Foundry,
Foundry & Pattern Making, Land & Mine Surveying, Mechanical,
Mining, Mechatronics, Metallurgy & Welding, Q. Surveying ,
Construction Machinery and Footwear Technologies)

MATH - 212 APPLIED MATHEMATICS - II

PART - B

Time: 2:30 hours

Marks: 80

SECTION - I

Q.1 Write short answers to any Twenty Five (25) of the following questions:- **25 x 2 = 50**

1. If $f(x) = 2x^2 + 4x + 9$, find the value of $\frac{f(3) - f(1)}{f(-1) + f(0)}$
2. If $f(x) = \sin x + \cos x$, Show that $f(x + \pi) = -f(x)$
3. Show that the function $f(x) = x^4 - 7x^2 + 7$ is even function of x .
4. If $f(x) = 3x^3 + 2x^2 - x + 4$, prove that $2f(3) = 25f(1)$
5. Find $\frac{dy}{dx}$ if $\sqrt{x} + \sqrt{y} = 5$
6. Find $\frac{dy}{dx}$ if $y = x^3 + x^2 + 2x + 3$
7. If $y = (3x^2 + 2x + 9)^7$, Find $\frac{dy}{dx}$
8. If $y = 5x^3 - 7x^2 + 9 - \frac{8}{x} + \frac{7}{x^4}$, find $\frac{dy}{dx}$
9. Find the derivative of $\sin^{-1}\left(\frac{x}{a}\right)$
10. Find the value of $\frac{d}{dx}(\sin^{-1}x + \cos^{-1}x)$
11. Find the value of $\frac{d}{dx} \sec^{-1}(\sqrt{x})$
12. Find the value of $\frac{d}{dx}(\cos^{-1}(1 - 2x^2))$
13. If $y = \cos(\ln x)$, show that $x^2y_2 + xy_1 = -y$
14. Find the slope of the tangent to the curve $y = \sin 2x$ at $x = \frac{\pi}{6}$
15. Find slope of tangent to the curve $y = \cos^2 x$ at $x = \frac{\pi}{4}$.
16. Find the slope of tangent to the curve $y = x^3 - 3x + 2$ at $(0, 2)$.
17. Find $\int \frac{-2x}{\sqrt{4-x^2}} dx$
18. Find $\int \frac{x^2+1}{x+1} dx$
19. Find $\int \left(1 + \frac{3}{x^2}\right)^2 dx$
20. Find $\int \frac{x}{a+x} dx$
21. Find $\int \frac{\cos(\ln x)}{x} dx$
22. Find the value of $\int \frac{x-1}{x^2-2x+3} dx$

23. Find the value of $\int \cot^2 x \, dx$.
24. Find $\int 2 \sec 2x \, dx$
25. Evaluate $\int_0^{\pi/4} \sec x \tan x \, dx$
26. Evaluate $\int_0^b x^3 \cos x^4 \, dx$
27. Evaluate $\int_0^{\pi/2} \frac{\cos x}{3 + 4 \sin x} \, dx$
28. Evaluate $\int_0^{\pi/6} 2 \sin 2x \, dx$
29. For the triangle whose vertices are A(0,1), B (7,2) and C(3,8). Find the length of the median from C to AB.
30. If the mid point of a segment is (6,3) and one end point is(8, -4), what are the co-ordinates of the other end point.
31. Find the angle between the lines having slopes -3 and 2
32. Find the slope of a line which is perpendicular to the line joining P₁ (2, 4) and P₂ (-2, 1).
33. Find the equation of a line through the point (3, -2) with slope $m = \frac{3}{4}$.
34. Find the equation of circle with centre on origin and radius is $\frac{1}{2}$.
35. Find centre and radius of the circle $x^2 + y^2 + 9x - 7y - 33 = 0$
36. Find the centre and radius of the circle $6x^2 + 6y^2 - 18y = 0$
37. What type of circle is represented by $x^2 + y^2 - 2x + 4y + 8 = 0$

SECTION - II

NOTE: ATTEMPT ANY THREE QUESTIONS.

3 x 10 = 30

- Q.2 (a) If $f(x) = \log \frac{1-x}{1+x}$, prove that $f(x) + f(y) = f\left(\frac{x+y}{1+xy}\right)$
- (b) Find $\frac{dy}{dx}$ if, $x = \frac{a(1-t^2)}{1+t^2}$, $y = \frac{2bt}{1+t^2}$
- Q.3 (a) Differentiate $\cos 2x$ from first principle method.
- (b) Find the maximum and minimum (extreme) values of the function $(x-4)^2(x-2)$.
- Q.4 (a) Evaluate $\int \frac{1}{\sqrt{1+x}-\sqrt{x}} \, dx$
- (b) Find the coordinates of the point that is equidistant from the points (2, 3), (0, -1) and (4, 5).
- Q.5 (a) Calculate $\int_0^{\pi/3} \frac{dx}{1-\sin x}$
- (b) Evaluate $\int \frac{dx}{\sqrt{a^2-x^2}}$
- Q.6 (a) Find the equation of the circle passing through the points (0,1), (3, -3) and (3, -1).
- (b) Differentiate the expression $\sec^{-1}\left(\frac{x^2+1}{x^2-1}\right)$ w.r.t. x.

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