

DAE/IA-2015/02 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 answer to any Twenty-Five (25) of the following questions: -

25 × 2 = 50

1.	If $f(p) = p + \frac{1}{p}$, Prove that $f(-p) = -f(p)$	2.	Is the following function even, odd or neither? $f(x) = x\sqrt{x^2 - 1}$
3.	Evaluate the limit: $\lim_{h \rightarrow 0} \frac{(1-h)^2 - 1}{h}$	4.	Evaluate the limit: $\lim_{x \rightarrow 0} \frac{1 - \cos x}{\sin^2 x}$
5.	Differentiate $2x^3 + 4x^2 - 5x + 8$ w.r.t. 'x'	6.	Find $\frac{dy}{dx}$ if $xy + y^2 = 2$
7.	Show that if $x = a\theta^2$, $y = 2a\theta$ then $y \frac{dy}{dx} - 2a = 0$	8.	Find the derivative of $x\sqrt{x+1}$ w.r.t. 'x'
9.	Differentiate $\frac{x^2}{x^2 - 1}$ w.r.t. 'x'	10.	Differentiate $\sin x^n$ w.r.t. 'x'
11.	Find the derivative of $x^2 \sec 4x$ w.r.t. 'x'	12.	Differentiate $\cos^{-1}(2x)$ w.r.t. 'x'
13.	Differentiate $\frac{x}{\ln x}$ w.r.t. 'x'	14.	Find $\frac{dy}{dx}$ if $y = e^{ax} \sin bx$
15.	Differentiate $\cos x$ w.r.t. $\tan x$	16.	Find the critical values (turning points) for x of the function $2x^4 - x^2$
17.	Evaluate $\int \sqrt{x}(x^2 + 3x + 2) dx$	18.	Evaluate $\int \cot^2 x dx$
19.	Evaluate $\int \cos^4 x \sin x dx$	20.	Evaluate $\int \frac{1}{\sqrt{x}} \sin \sqrt{x} dx$
21.	Find $\int (2x + 9)^{-5/2} dx$	22.	Find $\int (e^x + e^{2x} + e^{3x}) dx$
23.	Evaluate $\int x \cos x dx$	24.	Evaluate $\int x^2 \ln x. dx$
25.	Evaluate $\int_1^8 \frac{dx}{\sqrt[3]{x}}$	26.	Find the value of $\int_0^{\pi/6} \sec^2 x dx$
27.	Find the area of the region bounded by the curve $y = x^2$ from $x = -3$ to $x = 1$.	28.	Find the distance between $(2, -2)$ & $(2, 7)$
29.	Show that the two lines passing through the given points are perpendicular: $(8, 0)$, $(6, 6)$ and $(-3, 3)$, $(6, 6)$	30.	Show that the given points are collinear $(-4, 4)$, $(-2, 1)$ and $(6, -11)$
31.	Find the equation of the line through the point $(3, -2)$ with slope $m = \frac{3}{4}$.	32.	Find the mid-point of the following points: $A(0, 1)$, $B(-1, 2)$
33.	Reduce the given equation to intercepts form $6x - 5y = 15$	34.	Find the slope of a line which is perpendicular to the line joining $P_1(2, 4)$ and $P_2(-2, 1)$.
35.	Find the equation of circle with center at $(-2, 3)$ and radius 6.	36.	What type of circle is represented by $x^2 + y^2 - 2x + 4y + 8 = 0$
37.	Find the center and radius of the circle $x^2 + y^2 - 4x + 6y - 12 = 0$		

SECTION - IINote: *ATTEMPT ANY THREE QUESTIONS.*

3 × 10 = 30

Q.2: (a) Prove that $f[f(x)] = x$, for the function $f(x) = \frac{x+1}{x-1}$.

(b) Differentiate $\frac{x+1}{x^2+2x+2}$ w.r.t. 'x'.

Q.3: (a) If $x = a \cos^3 \theta$, $y = b \sin^3 \theta$ show that $a \frac{dy}{dx} + b \tan \theta = 0$.

(b) Find the maximum and minimum (Extreme) values of the following function.

$$\frac{x^3}{3} - 3 \frac{x^2}{2} + 2x + 5$$

Q.4: (a) Evaluate $\int \frac{dx}{\sqrt{x+a} + \sqrt{x+b}}$

(b) Evaluate $\int \sin^3 x \, dx$

Q.5: (a) Evaluate $\int x^2 \tan^{-1} x \, dx$

(b) Show that the points A(2, 2), B(6, 6) and C(11, 1) are the vertices of a right triangle.

Q.6: (a) Show that the given points are the vertices of a parallelogram:

$$(-3, 1), (-1, 7), (2, 8) \text{ and } (0, 2)$$

(b) Find the equation of the circle concentric with the circle $x^2 + y^2 - 6x + 4y - 12 = 0$ with radius 6 units.