DAE/IIA-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: - $25 \times 2 = 50$

1.	If $f(x) = a^x$, show that $f(x+y) = f(x)f(y)$	2.	Is the function $f(x) = 2x^3 - 9x$ is an even, odd or neither?
3.	Evaluate $\lim\limits_{x\to 1} \dfrac{x^2-1}{x-1}$	4.	Evaluate $\lim\limits_{x\to 0} \dfrac{\tan x}{x}$
5.	Differentiate $\dfrac{1}{5}x^{5/2} + \dfrac{1}{3}x^{3/2}$ w.r.t. 'x'.	6.	Find $\dfrac{dy}{dx}$ if $x^3 + y^3 + 4 = 0$
7.	Find $\dfrac{dy}{dx}$ if $x = \theta^2 - \theta - 1,\ y = 2\theta^2 + \theta + 1$	8.	Differentiate $\dfrac{x^2}{1+x^2}$ w.r.t. 'x'.
9.	Differentiate $2x^2 + x + 1$ w.r.t. $x^2 - x - 1$	10.	Differentiate $\cos^2(ax+b)$ w.r.t. 'x'.
11.	Differentiate $\sin x$ w.r.t. $\tan x$.	12.	Differentiate $\sin^{-1} x^2$ w.r.t. 'x'.
13.	Differentiate $x\ell nx - x$ w.r.t. 'x'.	14.	Find $\dfrac{dy}{dx}$ if $y = e^x \ell n x$
15.	Differentiate $x\cot x$ w.r.t. 'x'.	16.	Find the critical values (turning points) for x of the function $x^3 + 4x^2 - 3x - 5$
17.	Evaluate $\int (3x^2 + 2x + 1)\,dx$	18.	Evaluate $\int (\sin x - \cos x)^2\,dx$
19.	Evaluate $\int (\tan^4 x + \tan^2 x)\,dx$	20.	Evaluate $\int \dfrac{dx}{x\sqrt{1+\ell nx}}$
21.	Find $\int \dfrac{x^2+1}{x+1}\,dx$	22.	Evaluate $\int (e^x + e^{-x})^2\,dx$
23	Evaluate $\int x.\sin x\,dx$	24.	Evaluate $\int \ell n x\,dx$
25.	Evaluate $\int_1^3 \left(x - \dfrac{1}{x}\right)dx$	26.	Find the value of $\int_0^{\pi/6} \sin x \cos x\,dx$
27.	Find the area bounded by the curve $y = x^3 + 3x^2$, the x-axis and the lines $x = 0$ and $x = 2$.	28.	Find the distance between: $(-4, 2)$ & $(0, 5)$
29.	What are the x and y-intercepts of $3x + 4y = 12$?	30.	Show that the given points are collinear $(1, 0)$, $(4, -12)$ & $(2, -4)$
31.	Find the coordinates of the mid-point of the segment $P_1(3, 7)$, $P_2(-2, 3)$	32.	Is the point $(0, 4)$ inside or outside the circle of radius 4 with center at $(-3, 1)$?
33.	Reduce the given equation to Slope-intercept form $6x - 5y = 15$.	34.	For the triangle $A(1, 3), B(-2, 1), C(0, -4)$ Find the slope of line parallel to $\overline{AC}$.
35.	Find the equation of the circles with center $(1, -3)$ and radius $r = 3$.	36.	Find the center and radius of the circle: $x^2 + y^2 + 9x - 7y - 33 = 0$
37.	Find the equation of the circles which touches both the axes of 4th-quadrant and has a radius of 5 units?		

SECTION – II

Note: *ATTEMPT ANY THREE QUESTIONS.* $3 \times 10 = 30$

Q.2: **(a)** Show that $\frac{e^x + 1}{e^x - 1}$ is an odd function of x.

(b) Differentiate $\sqrt{\frac{a+x}{a-x}}$ w.r.t. 'x'.

Q.3: **(a)** If $y = a\sin\theta + b\cos\theta$, show that $y^2 + \left(\frac{dy}{d\theta}\right)^2 = a^2 + b^2$

(b) Discuss for relative maxima and minima of the function $y = x^3 - 3x^2 + 2$

Q.4: **(a)** Evaluate $\int\left(\frac{x^2 - 8}{x+2}\right)dx$

(b) Evaluate $\int \tan^4 x\, dx$

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

(b) If a line ℓ_1 contains (2, 6) and (0, y). Find 'y' if ℓ_1 is parallel to ℓ_2 and the slope of $\ell_2 = \frac{3}{4}$.

Q.6: Find the equation of the circle passing through the points $(-2, 1)$, $(-4, -3)$ & $(3, 0)$.

==========