(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:- $25 \times 2 = 50$

1.	If $f(x) = 2x^2 + 4x + 9$, find the value of $\dfrac{f(3) - f(1)}{f(-1) + f(0)}$	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.	If $y = \sqrt{x} - \dfrac{1}{\sqrt{x}}$, Then show that $2x\dfrac{dy}{dx} + y = 2\sqrt{x}$	6.	Find $\dfrac{d}{dx}\left(\dfrac{1}{(ax+b)^m}\right)$
7.	If $y = x - \sqrt{x^2 + 1}$, Then show that $(y - x)\dfrac{dy}{dx} = y$	8.	If $y = 1 + x + \dfrac{x^2}{2!} + \dfrac{x^3}{3!} + \dfrac{x^4}{4!} \ldots$, Then show that $\dfrac{dy}{dx} = y$
9.	Find the derivative of $\sin^{-1}\left(\dfrac{x}{a}\right)$	10.	Find the value of $\dfrac{d}{dx}(\sin^{-1}x + \cos^{-1}x)$
11.	Find the value of $\dfrac{d}{dx}\sec^{-1}(\sqrt{x}\,)$	12.	Find the value of $\dfrac{d}{dx}(\cos^{-1}(1 - 2x^2))$
13.	If $y = x^4 - 3x^2 + 4x - 1$, find $\dfrac{d^2y}{dx^2}$	14.	If $y = \ell nx$, find y_2
15.	If $y = \cos 3x + \sin 3x$, show that $y_2 + 9y = 0$	16.	If $y = A e^{mx} + B e^{-mx}$, show that $y_2 - m^2 y = 0$
17.	Find $\int (2x + 9)^{-5/2}dx$	18.	Find $\int \dfrac{1}{\sqrt[3]{(3x + 4)^2}}\, dx$
19.	Find $\int (x + \dfrac{1}{x})^2 dx$	20.	Find $\int \left(\dfrac{1}{t^3} + \dfrac{1}{t^2} - 2\right) dt$
21.	Find $6\int x^2 . e^{x^3}\, dx$,	22.	Find the value of $\int \dfrac{\sin^{-1}x}{\sqrt{1 - x^2}}\, dx$
23.	Find $\int \dfrac{\cos(\ell nx)}{x}dx$	24.	Find the value of $\int \dfrac{x - 1}{x^2 - 2x + 3}\, dx$
25.	Evaluate $\int_{0}^{\pi/2} \dfrac{\cos x}{3 + 4\sin x}\, dx$	26.	Evaluate $\int_{0}^{\pi/6} 2\sin 2x\, dx$
27.	Evaluate $\int_{-\pi/2}^{\pi/2} \cos x\, dx$	28.	Evaluate $\int_{0}^{\pi/6} \sec^2 x\, dx$
29.	Write distance formula between two points and give one example.	30.	Find distance between the points $(-3, 1)$ and $(3, -2)$
31.	Show that the points A$(-1, -1)$, B$(4, 1)$ and C$(12, 4)$ lies on a straight line.	32.	Find the co-ordinate of the mid point of the segment $P_1 (3,7)$, $P_2 (-2, 3)$.
33.	Find the co-ordinates of the point P(x,y) which divide internally the segment through $P_1 (-2,5)$ and $P_2 (4, -1)$ of the ratio of $\dfrac{r_1}{r_2} = \dfrac{6}{5}$.	34.	Find the equation of circle with centre on origin and radius is $\dfrac{1}{2}$.
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 $f(x) = \dfrac{x-1}{x+1}$, show that $\dfrac{f(x)-f(y)}{1+f(x)\,f(y)} = \dfrac{x-y}{1+xy}$.

    (b)   Differentiate $x^{\frac{2}{3}}$ by ab-initio method.

Q.3   (a)   Differentiate $\cos 2x$ from first principle method.

    (b)   Use differentials to find the approximate value of $\sqrt{65}$

Q.4   (a)   Evaluate $\displaystyle\int \dfrac{1}{\sqrt{1+x}-\sqrt{x}}\,dx$

    (b)   Evaluate $\displaystyle\int \dfrac{dx}{\sqrt{a^2-x^2}}$

Q.5   (a)   Calculate the Integral $\displaystyle\int_{0}^{3} \sqrt[3]{(3x-1)^2}\,dx$

    (b)   Find which of the two circles
    $x^2 + y^2 - 3x + 4y = 0$ and $x^2 + y^2 - 6x - 8y = 0$ is greater.

Q.6   (a)   If a line ℓ_1 contains P (2, 6) and (0, y). Find y if ℓ_1 is parallel to
    ℓ_2 and that the Slope of $\ell_2 = \dfrac{3}{4}$

    (b)   Find an equation of the line which is perpendicular to the line
    $4x + 7y = 5$ and passes through $(-1, 2)$.

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