DAE/IIA-2020/Special(Covid-19)
Examination, 2020/02   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
<u>**PART – B**</u>

Time: 2:30 hours   Marks:80

<u>**SECTION – I**</u>

Q.1: Write short answer to any Twenty-Five (25) of the following questions: - $25 \times 2 = 50$

1.	If $f(x) = 2x\sqrt{1-x^2}$, find $f(\sin\theta)$	2.	Find $\displaystyle \lim_{x \to 1} \frac{x^3 - 1}{x - 1}$
3.	Is the function $f(x) = \dfrac{x}{x^2+1}$ even, odd or neither?	4.	Evaluate $\displaystyle \lim_{x \to \infty} \left(1 + \frac{2}{x}\right)^x$
5.	If $y = 5x^3 - 7x^2 + 9 - \dfrac{8}{x} + \dfrac{7}{x^4}$, find $\dfrac{dy}{dx}$	6.	If $ax^2 + by^2 + 2hxy = 0$, find $\dfrac{dy}{dx}$
7.	If $y = \dfrac{1+x}{1-x}$, find $\dfrac{dy}{dx}$	8.	Differentiate $2x^2 + x + 1$ w.r.t. $x^2 - x - 1$
9.	Find the value of $\dfrac{d}{dx}\left(\dfrac{1-\cos x}{\sin x}\right)$	10.	Find the derivative of $\left(\sec^{-1} x\right)^3$
11.	If $x = \sin 2t$, $y = 2\cos t$, then find $\dfrac{dy}{dx}$.	12.	Find $\dfrac{d}{dx}\left(a^{x^2}\right)$.
13.	If $y = \ell n\, x$, find y_2	14.	Differentiate $\sin[\sin(\cos x)]$ w.r.t. 'x'.
15.	If $s = \log(t)$,, find the velocity and acceleration at $t = 3\sec$.	16.	Find the turning points of the curve $y = 2x^3 - 15x^2 + 36x + 10$
17.	Find $\int\left(\dfrac{1}{t^3} + \dfrac{1}{t^2} - 2\right)dt$	18.	Find $\int\left(\dfrac{x^2+1}{x+1}\right)dx$
19.	Find $\int\left(\dfrac{\sin 2x}{\cos^2 2x}\right)dx$	20.	Integrate $\int \sin^2 x\, dx$
21.	Find the value of $\int \cot^2 x\, dx$	22.	Find $\int \dfrac{1}{25+x^2}dx$
23	Evaluate $\int x \cos x\, dx$	24.	Evaluate $\int xe^{x^2}\, dx$
25.	Evaluate $\int_0^{\pi/6} 2\sin 2x\, dx$	26.	Evaluate $\int_{\pi/6}^{\pi/3}\left(\cos ec^2 x\right)dx$
27.	Evaluate $\int_1^3 \dfrac{1}{x+1}dx$	28.	Evaluate $\int \dfrac{dx}{x(1+\ell n\, x)}$
29.	Write distance formula between two points.	30.	Find an equation on the line with the following intercepts: a = 2, b = –5.
31.	Show that the lines passing through points $(0, -7)$, $(8, -5)$ and $(5, 7)$, $(8, -5)$ are perpendicular.	32.	Find the distance to the line $3x - 2y + 12 = 0$ from the point $(-1, 7)$.
33.	Find the midpoint of the points $A(6, -2)$ and $B(2, 1)$.	34.	Define real circle.
35.	Find the equation of circle with center $(-1, 2)$ and radius $r = \sqrt{2}$.	36.	Reduce the equation $x^2 + y^2 - 4x + 6y - 12 = 0$ into standard form.
37.	Write the general form of the circle, also represent the center and radius in this form.		

<u>SECTION – II</u>

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

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

(b) If $x = \dfrac{1-t^2}{1+t^2},\ y = \dfrac{2t}{1+t^2}$ then prove that : $y\dfrac{dy}{dx} + x = 0$

Q.3: **(a)** Find the derivative of $\sin^m x \sin mx$ w.r.t. 'x'.

(b) Find the maximum and minimum values of the function $\left(x-2\right)^2\left(x-1\right)$.

Q.4: **(a)** Find the anti-derivative of $\displaystyle\int \left(\sin x + \cos x\right)^2 \left(\cos^2 x - \sin^2 x\right) dx$

(b) Evaluate $\displaystyle\int \left(x\cos^2 x\right) dx$

Q.5: **(a)** Evaluate $\displaystyle\int \left(\sec^3 x\right) dx$

(b) Is the point $\left(0,\,4\right)$ inside or outside the circle of radius 4 with center at $\left(-3,\,1\right)$.

Q.6: **(a)** If a line ℓ_1 contains $P\left(2,\,6\right)$ and $Q\left(0,\,y\right)$. find y if ℓ_1 is parallel to ℓ_2 and the slope of $\ell_2 = \dfrac{3}{4}$.

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

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