**DAE/IA – 2019/02 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***

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|---|---|---|---|
| 1. | Find $\lim_{n\to\infty}\left(1+\frac{1}{n+1}\right)^n$ | 2. | Find $\lim_{x\to o}\frac{\sin x^o}{x}$ |
| 3. | Find the value of $\lim_{x\to 0}\left(1+\frac{x}{3}\right)^{1/x}$ | 4. | Evaluate $\lim_{x\to 0}\frac{\tan x}{x}$ |
| 5. | Find $\frac{dy}{dx}$ if $x^{2/3}+y^{2/3}=a^{2/3}$ | 6. | If $ax^2+by^2+2h\,xy=0$, find $\frac{dy}{dx}$ |
| 7. | Differentiate $\frac{x^3}{1+x^3}$ w.r.t. $x^3$ | 8. | Find $\frac{dy}{dx}$ if $x=u+\frac{1}{u}$, $y=u-\frac{1}{u}$ |
| 9. | Find the differential co-efficient of $e^{\tan^{-1}x}$ | 10. | Find the derivative of $e^{-2\log x}$ w.r.t. x |
| 11. | Find $\frac{d}{dx}(e^{2x}\cos 2x)$ | 12. | Find the value of $\frac{d}{dx}(x^x)$ |
| 13. | Find the acceleration of the moving particle given according to the law $V^2=4S-10$, where S and V have their usual meaning. | 14. | If S =log t, find the velocity and acceleration at t = 3 sec. |
| 15. | The distance x meters moved by a particle in t seconds is given by $x=t^3+3t^2+4$ Find the velocity and acceleration after 3 seconds | 16. | If S =Sin 2t, find the velocity at $t=\frac{\pi}{6}$ |
| 17. | Evaluate $\int\left(\sqrt{x}+\frac{1}{\sqrt{x}}\right)^2 dx$ | 18. | Find $\int \sin^2 x\,dx$ |
| 19. | Find $\int(\sin x-\cos x)^2\,dx$ | 20. | Find $\int\frac{\cot x}{\ln\sin x}\,dx$ |
| 21. | Evaluate $\int 3x\sqrt{1-2x^2}\,dx$ | 22. | Evaluate $\int\frac{e^{m\tan^{-1}x}}{1+x^2}\,dx$ |
| 23. | Evaluate $\int x\cos x\,dx$ | 24. | Evaluate $\int ln\,x\,dx$ |
| 25. | Find the value of $\int_0^{\pi/2}\sin^2 x\cos x\,dx$ | 26. | Find the value of $\int_0^{\pi} x\cos x\,dx$ |
| 27. | Find the value of $\int_0^{1} x\,e^x\,dx$ | 28. | Find the value of $\int_{-1}^{1}(3x^2-x^3)dx$ |
| 29. | Find the rectangular coordinates of the point with polar coordinates $(4, 30^o)$ | 30. | Show that the point $(3,\sqrt{7})$ is on a circle with centre at the origin and radius 4. |
| 31. | Is the point (0,4) inside or outside the circle of radius 4 with centre at (–3, 1) ? | 32. | Find the value of y so that the distance between (1, y) and (–1, 4) is 2. |
| 33. | Find an equation of the line with slope $-\frac{2}{3}$ and having y- intercept 3. | 34. | Define the Real circle |
| 35. | Define the Point circle | 36. | Define the Imaginary circle |
| 37. | Find the equation of the circle which touches both the axes of 4th quadrant and has a radius of 5 units. | | |

## *SECTION - II*

***NOTE: ATTEMPT ANY THREE QUESTIONS.*** *3 x 10 = 30*

Q.2 (a) Prove that $\lim_{\theta \to 0} \frac{\sin\theta}{\theta} = 1$, where θ is in radian.

(b) Differentiate $\frac{x^2 + a^2}{x^2 - a^2}$ w.r.t. $\frac{x - a}{x + a}$

Q.3 (a) Find $\frac{dy}{dx}$ when $x = a(\cos t + \sin t)$, $y = a(\sin t - t \cos t)$

(b) Show that $\frac{\ln x}{x}$ has a maximum value at $x = e$

Q.4 (a) Evaluate $\int \frac{a\sin^3 x + b\cos^3 x}{\sin^2 x \cos^2 x} dx$

(b) Evaluate $\int \frac{dx}{(a^2 - x^2)^{3/2}}$

Q.5 (a) Show that area of a circle of radius r is $\pi r^2$.

(b) Find the equation of the circle having(–2, 5) and (3, 4) as the end points of its diameter. Find also its centre and radius.

Q.6 (a) Show that the following lines are concurrent. Also find the point of concurrency
$3x - 5y + 8 = 0$, $x + 2y - 4 = 0$ and $4x - 3y + 4 = 0$

(b) The mid points of the sides of a triangle are at (–1, 4), (5, 2) and (2, –1). Find its vertices.

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