Roll No. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E / B. Tech (Full Time) END SEMESTER EXAMINATIONS – APRIL / MAY 2024

(COMMON TO ALL)
Semester-I
MA7151 & MATHEMATICS-I

(Regulation 2015)

Time: 3 Hours | Answer ALL Questions | Max. Marks 100

PART- A (10 x 2 = 20 Marks)

Q.No	Questions	Marks
1.	Prove that $\lim_{x\to 0} x^2 \cos\left(\frac{1}{x}\right) = 0$ squeeze theorem	2
2.	Use intermediate value theorem to show that there is a root of the given equation in the specified interval $f(x) = e^x - 3 + 2x$ in (0,1)	2
3.	If x=rcos θ and y=r sin θ then Find the the $\frac{\partial(x,y)}{\partial(r,\theta)}$	2
4.	State Euler's theorem for homogeneous function.	2
5.	Evaluate $\int_{-1}^{1} \frac{dx}{x^2}$. If the integral does not exist justify your answer?	2
6.	What do mean by improper integral Explain	2
7.	Evaluate $\int_0^1 \int_0^2 xy\, dxdy$	2
8.	Evaluate $\int_0^{\pi} \int_0^{sin\theta} r\, drd\theta$	2
9.	Check whether the solution of the differential equation $(D^2 + 4)y = 0$ are linearly independent?	2
10.	Solve $(D^3 - 1)y = 0$	2

PART- B (5 x 16 = 80 Marks)

(Q. No 11 is Compulsory)

Q.No	Questions	Marks
11.	(i) Solve $(D^2 + a^2)y = tanax$ by method of variation of Parameters (ii) Solve: $x^2\left(\frac{d^2y}{dx^2}\right) + 4x\left(\frac{dy}{dx}\right) + 2y = x^2 + \frac{1}{x^2}$	16

12.	a)(i)Discuss the continuity at x=1and x=3 where $f(x) = \begin{cases} x+1, if\ x \le 1 \\ \frac{1}{x}, if\ 1 < x < 3 \\ \sqrt{x-3}, if\ x \ge 3 \end{cases}$ a)(ii)Determine whether $f'(0)$ *exists.* $f(x) = \begin{cases} xsin\left(\frac{1}{x}\right), x \neq 0 \\ 0, x = 0 \end{cases}$	16
	OR	
	b)(i) Find the points on the curve $y = x^4 - 6x^2 + 4$ where the line is horizontal (ii)Discuss the curve $y = x^4 - 4x^3$ with respect to concavity,points of inflection and local maxima and local minima	16
13.	a)(i)Find the maxima and minima of the function $f(x,y) = x^3 + y^3 - 12x - 3y + 20$ (ii) Find the Taylor's series expansion of $f(x,y) = e^x cosy$ up to third degree.	16
	OR	
	b)(i) The Temperature T at any point (x,y,z) in the space is $T(x,y,z) = 400xyz^2$.Find the highest temperature on the surface of the unit sphere $x^2 + y^2 + z^2 = 1$. b)(ii) Prove that $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ if $u = log(x^2 + y^2) + tan^{-1}\left(\frac{y}{x}\right)$	16
14.	a)(i) Find $\int_0^1 tan^{-1}(x)dx$ a)(ii) Prove that $\int cos^n xdx = \frac{1}{n}cos^{n-1}xsinx + \frac{n-1}{n}\int cos^{n-2}xdx$	16
	OR	
	b)(i)Evaluate $\int \frac{2x^2-x+4}{x^3+4x}dx$ b(ii)Evaluate $\int \frac{x}{\sqrt{x^2+4}}dx$	16
15.	a)(i)Change the order of integration and hence evaluate it $\int_0^1 \int_{x^2}^{2-x} xydxdy$ a(ii)Evaluate $\int_0^1 \int_0^2 \int_0^3 xy^2 zdzdydx$	16
	OR	
	b)(i)Find the volume of sphere $x^2 + y^2 + z^2 = a^2$ by using triple integration b)(ii)Find the Area between two paraolas y^2 =4ax and $x^2 = 4ay$	16