Total No. of Questions – [4]　　　　　　　　Total No. of Printed Pages: [3]

G.R. No.		PAPER CODE	U113 – 201 (B)

Dec 2023 (Backlog) EXAM

F.Y. B. TECH. (PATTERN 2018)

COURSE NAME: Engineering Mathematics II

COURSE CODE: ES12181

Time: [2Hr]　　　　　　　　　　　　　　[Max. Marks: 60]

(*) Instructions to candidates:

1) Use of scientific calculator is allowed
2) Use suitable data where ever required
3) All questions are compulsory

Que. No.	Question Description	Max. Marks	CO mapped	BT Level
Q1.	**Choose the Correct options**			
	i) The order and degree of the differential equation $$\frac{d^2y}{dx^2} = \left[y + \left(\frac{dy}{dx} \right)^2 \right]^{1/4}$$ are (a) 4 and 2　　　(b) 1 and 2 (c) 1 and 4　　　(d) 2 and 4	[2]	CO1	Understand
	ii)) The solution of the DE $\frac{dy}{dx} + y = e^{-x}$ is (a) $y = (x + c)\, e^x$　　(b) $ye^x + x = c$ (c) $ye^x = x + c$　　(d) None of these	[2]	CO1	Remember
	iii) The DE $M(x, y)\, dx + N(x, y)\, dy = 0$ is an Exact DE if (a) $\frac{\partial M}{\partial y} \neq \frac{\partial N}{\partial x}$　　(b) $\frac{\partial M}{\partial x} = \frac{\partial N}{\partial y}$ (c) $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$　　(d) $\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x} = 1$	[2]	CO1	Remember
	iv) The general solution of the DE $\frac{dy}{dx} = 3x^2y + 2y$ is (a) $y = x^3 + 2x + c$　　(b) $y = e^{x^3} + 2x + c$ (c) $y = x^3 - 2x + c$　　(d) $y = ce^{(x^3 + 2x)}$	[2]	CO1	Remember
	v) The general solution of the DE $xdy = ydx$ is a family of (a) Circles　　(b) Ellipse　　(c) Parallel lines (d) Lines passing through the origin	[2]	CO1	Understand
	vi) The orthogonal trajectories of the family of rectangular hyperbola $xy = c$ is (a) $x^2 - y^2 = A$　　(b) $x^2 + y^2 = A^2$ (c) $y = mx$　　(d) $x = y^2 A$	[2]	CO2	Remember
	vii)) Water at temperature 100°C cools in 10 minutes to 88°C in a room of temp 25°C, then the temperature of water after 20 minutes is	[2]	CO2	Understand

	(a) 78° C (b) 85° C (c) 76°C (d) 70°C			
	viii) The current in the circuit is calculated from the formula $Ri + L\dfrac{di}{dt} = E \sin \omega t$ then integration factor of D.E is (a) $\dfrac{R}{L}$ (b) $e^{\frac{Rt}{L}}$ (c) $e^{\frac{t}{RL}}$ (d) $E \sin \dfrac{\omega t}{L}$	[2]		Understand
	ix) Orthogonal trajectories for the family of curves $y^2 = 2\,cx + c^2$ is (a) $y^2 = 2\,ax$ (b) $xy = c$ (c) $x^2 + y^2 = a^2$ (d) $y^2 = 2cx + c^2$	[2]	CO2	Understand
	x) If 10% of radium disappears in 2 days how long will it take for 50% to be disappear (a)10 days (b) 15 days (c) 12 days (d) 13 days	[2]	CO3	Understand
	xi) The equation of the tangent at origin to the curve $x^2 (2a - y) = y^3$ is (a) $x = 0$ (b) $y = a$ (c) $y = 0$ (d) $y = 2a$	[2]	CO3	Understand
	xii) The points o intersection of the curve $a^2 y^2 = x^2 (a^2 - x^2)$ is (a) (0, 0), (a, 0) (b) (0, 0) (c) (0, 0), (a, 0), (− a, 0) (d) (0, 0), (− a, a)	[2]	CO3	Understand
	xiii) The asymptote to the curve $x^2 (2a - y) = y^3$ is (a) $x = 0$ (b) $y = 0$ (c) $y = a$ (d) $y = 2a$	[2]	CO3	Understand
	xiv) The equation of tangent to the curve $r = a (1 + \cos \theta)$ at the origin is (a) $\theta = 0$ (b) $\theta = \pi$ (c) $\theta = \dfrac{\pi}{2}$ (d) $\theta = \dfrac{3\pi}{2}$	[2]	CO3	Remember
	xv)) The curve $r = a \cos 2\theta$, $a > 0$ has how many loops (a) 2 (b) 6 (c) 1 (d) 4	[2]	CO3	Remember
Q.2	Attempt any two of the following			
	a) Find equation of sphere whose centre is $(2, -3, 1)$ and radius 5.	[5]	CO4	Apply
	b) Find equation of Right circular cone which passes through the poi with vertex at the origin and axis parallel to the line $\dfrac{x - 2}{5} = \dfrac{y - 1}{1} = \dfrac{z + 2}{1}$	[5]	CO4	Apply
	c) Find equation of right circular cylinder of radius 3 whose axis is the	[5]	CO4	Apply

	line $\frac{x-1}{2} = \frac{y-3}{2} = \frac{z-5}{-1}$.				
Q.3	Attempt any two of the following				
	a) Evalute $\int_0^1 \int_0^{1-x}(x+y)dy\,dx$	[5]	CO5	Understand
	b) Show that $\int_0^a \int_0^{\sqrt{a^2-x^2}} e^{-x^2-y^2}\,dx\,dy = \frac{\pi}{4}(1-e^{-a^2})$	[5]	CO5	Understand
	c) Evalute $\int_0^1 \int_0^1 (x^2+y^2)dy\,dx$ $+4$	[5]	CO5	Understand
Q.4	Attempt any two of the following				
	$a)$ Find area of the region bounded by $x^2 = y$ and $y^2 = x$.	[5]	CO6	Understand
	$b)$ Find volume of a sphere $x^2 + y^2 + z^2 = 4$.	[5]	CO6	Understand
	c) Find centre of gravity of the area enclosed by the curves $y^2 = 4ax$ and $y = 2x$.	[5]	CO6	Understand