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EAST POINT COLLEGE OF ENGINEERING & TECHNOLOGY
An Autonomous Institution Affiliated to Visvesvaraya Technological University (VTU) Belagavi

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EPMTM201

Second Semester B.E. Degree Examination, May 2026
MATHEMATICS FOR ME- STREAM-II

TIME:3 hrs. Max.Marks:100

Note: 1. Answer any FIVE full questions, choosing ONE question from each MODULE
2. Formula Hand Books Permitted
3. M: Marks, L: Bloom's level, C: Course outcomes.

		Module-1	M	L	C
Q.1	a	Evaluate $\int_0^1 \int_x^{x^2} (x+y)dydx$.	6	L3	CO1
	b	Change the order of integration and evaluate $\int_0^\infty \int_x^\infty \frac{e^{-y}}{y} dydx$.	7	L3	CO1
	c	Prove that $\int_0^{\pi/2} \sqrt{sin\theta} d\theta \cdot \int_0^{\pi/2} \frac{d\theta}{\sqrt{sin\theta}} = \pi$	7	L3	CO1
		OR			
Q.2	a	Derive the relation between Beta and Gamma function as, $\beta(m,n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$	6	L2	CO1
	b	Evaluate $\int_{-a}^{a} \int_0^{\sqrt{a^2-x^2}} \sqrt{x^2+y^2}\, dydx$. by changing into polar coordinates.	7	L3	CO1
	c	Find the area enclosed by the parabolas $y^2 = 4ax$ and $x^2 = 4ay$.	7	L3	CO1
		Module–2			
Q.3	a	Find the angle between the surfaces $x^2 + y^2 - z^2 = 4$ and $z = x^2 + y^2 - 13$ at (2,1,2).	6	L2	CO2
	b	Find the constants a, b and c such that the vector $\vec{F} = (x + y + az)i + (bx + 2y - z)j + (x + cy + 2z)k$ is irrotational.	7	L2	CO2
	c	Find div$\vec{F}$ and curl$\vec{F}$. Where $\vec{F} = grad(x^3 + y^3 + z^3 - 3xyz)$ *at* (1,1,1).	7	L2	CO2
		OR			
Q.4	a	Find the directional derivative of $\phi = x^2yz + 4xz^2$ at $(1,-2,-1)$ along the direction of the vector $(2i - j - 2k)$.	6	L2	CO2
	b	Show that $\vec{F} = (y^2 - z^2 + 3yz - 2x)i + (3xz + 2xy)j + (3xy - 2xz + 2z)k$ is both solenoidal and irrotational.	7	L2	CO2
	c	Using Greens theorem, evaluate $\oint (3x^2 - 8y^2)dx + (4y - 6xy)dy$, where c is the closed curve of the region bounded by $y = \sqrt{x}$ *and* $y = x^2$.	7	L2	CO2
		Module–3			
Q.5	a	Form PDE by eliminating arbitrary functions:$\phi(xy + z^2,\ x + y + z) = 0$	6	L3	CO3
	b	Solve: $\frac{\partial^2 z}{\partial x^2} + 3\frac{\partial z}{\partial x} - 4z = 0$ subject to $z = 1$ and $\frac{\partial z}{\partial x} = y$ when $x = 0$	7	L3	CO3
	c	Derive one-dimensional wave equation in the form $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$	7	L3	CO3

OR

Q.6	**a**	Form the partial differential equation by eliminating the arbitrary constants from the relation $(x-a)^2+(y-b)^2+z^2=4$.	**6**	**L3**	**CO3**
	b	Solve: $\frac{\partial^2 z}{\partial y^2}=z$ given that $y=0, z=e^x$ and $\frac{\partial z}{\partial x}=e^{-x}$.	**7**	**L3**	**CO3**
	c	Solve: $x^2(y-z)p+y^2(z-x)q=z^2(x-y)$ using Lagrange's multipliers.	**7**	**L3**	**CO3**

Module–4

Q.7	**a**	Find a real root of the equation $x\,sinx+cos\,x=0$, near $x=\pi$ correct to four decimal places. Using Newton –Raphson.	**6**	**L2**	**CO4**
	b	Using Newton's backward interpolation formula find y at x= 5.2 for the data. x: 1, 2, 3, 4, 5 y: 10, 26, 58, 112, 194	**7**	**L3**	**CO4**
	c	Evaluate $\int_0^1 \frac{1}{1+x^2}dx$ by using Simpson's 1/3rd rule by taking 7 ordinates.	**7**	**L3**	**CO4**

OR

Q.8	**a**	Find the real root of the equation $cosx=xe^x$ upto four decimal places using Regula-falsi method.	**6**	**L2**	**CO4**
	b	Using Newton's divided difference formula find f(5) from the following data: x: 0, 2, 3, 4, 7, 9 y: 4, 26, 58, 112, 466, 922	**7**	**L3**	**CO4**
	c	Evaluate $\int_4^{5.2} logx\,dx$ taking 6 equal parts. Using Simpson's 3/8th rule.	**7**	**L3**	**CO4**

Module–5

Q.9	**a**	Employ Taylor's series method find y at x = 0.1 given that $\frac{dy}{dx}=2y+3e^x; y(0)=0$. Up to 4th degree terms.	**6**	**L2**	**CO5**
	b	Using Runge Kutta a method of fourth order to find an approximate value ofy(0.2) given that $\frac{dy}{dx}=x^2+y\ with\ y(0)=1$. Taking h=0.2	**7**	**L2**	**CO5**
	c	Given $y'=(x-y)^2$ and the data $y(0)=0, y(0.2)=0.02,$ $y(0.4)=0.0795, y(0.6)=0.1762$. Compute $y(0.8)$ by Milne's method.	**7**	**L2**	**CO5**

OR

Q.10	**a**	Using Modified Euler's method find $y(0.1)$ given that $\frac{dy}{dx}=x+y$, with $y(0)=1$, taking $h=0.1$ carryout 3 modifications.	**6**	**L2**	**CO5**
	b	Solve: $\frac{dy}{dx}=2e^x-y$ given that $y(0)=2,\ y(0.1)=2.010,\ y(0.2)=2.040,\ y(0.3)=2.090$. Find $y(0.4)$ using Mine's predictor corrector method.	**7**	**L2**	**CO5**
	c	Using Runge- Kutta method of order 4, find $y(0.1)$ for the equation $\frac{dy}{dx}=\frac{y-x}{y+x}$, $y(0)=1$taking h =0.1	**7**	**L2**	**CO5**

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