MAKE-UP EXAM

BMATS201

Mathematics – II for CSE Stream

Time: 3 hrs.   Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
*   2. VTU Formula Hand Book is permitted.*
*   3. M : Marks , L: Bloom's level , C: Course outcomes.*

		Module – 1	M	L	C
Q.1	a.	Evaluate $\int\limits_{-c}^{c}\int\limits_{-b}^{b}\int\limits_{-a}^{a}(x^2+y^2+z^2)\,dz\,dy\,dx$	7	L2	CO1
	b.	Evaluate $\int\limits_{0}^{\infty}\int\limits_{0}^{\infty}e^{-(x^2+y^2)}\,dx\,dy$ by changing into polar coordinates.	7	L2	CO1
	c.	Prove that $\beta(m,n)=\dfrac{\Gamma m - \Gamma n}{\Gamma m + n}$.	6	L2	CO1
		OR			
Q.2	a.	Evaluate $\int\limits_{0}^{1}\int\limits_{x}^{\sqrt{x}}xy\,dy\,dx$ by changing the order of integration.	7	L3	CO1
	b.	Prove that $\int\limits_{0}^{\pi/2}\sqrt{\cot\theta}\,d\theta = \dfrac{\pi}{\sqrt{2}}$	7	L2	CO1
	c.	Using mathematical tools, write the code to find the area of an ellipse by double integration $A = 4\int\limits_{0}^{a}\int\limits_{0}^{\frac{b}{a}\sqrt{a^2-x^2}}dy\,dx$	6	L3	CO5
		Module – 2			
Q.3	a.	Find div $\vec{F}$ and curl $\vec{F}$, If $\vec{F} = \nabla(x^3+y^3+z^3-3xyz)$	7	L2	CO2
	b.	Find the directional derivative of $\phi = x^2yz+4xz^2$ at $(1, -2, -1)$ Along the direction of the vector $(2i-j-2K)$.	7	L2	CO2
	c.	Prove that the spherical coordinate system is orthogonal.	6	L3	CO2
		OR			
Q.4	a.	Find the angle between the surfaces $x^2+y^2+z^2=9$ and $z=x^2+y^2-3$ at the point $(2,-1,2)$.	7	L3	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 the mathematical tools, write the codes to find the divergence of $\vec{F}=x^2yi+yz^2j+x^2z\,K$.	6	L3	CO5

		Module – 3			
Q.5	a.	Prove that the subset W = {(x, y, z) / x − 3y + 4z = 0} of the vector space R^3 is a subspace of R^3.	7	L3	CO3
	b.	Determine whether the matrix A = $\begin{bmatrix} 3 & -1 \\ 1 & -2 \end{bmatrix}$ is a linear combination of B = $\begin{bmatrix} 1 & 1 \\ 0 & -1 \end{bmatrix}$, C = $\begin{bmatrix} 1 & 1 \\ -1 & 0 \end{bmatrix}$ and D = $\begin{bmatrix} 1 & -1 \\ 0 & 0 \end{bmatrix}$ in the vector space M_{22} of 2×2 matrices.	7	L2	CO3
	c.	Find the linear transformation T : $V_2(R) \rightarrow V_3(R)$ such that T(1, 1) = (0, 1, 2), T(−1, 1) = (2, 1, 0).	6	L2	CO3
		OR			
Q.6	a.	Determine whether the vectors V_1 = (1, 2, 3), V_2 = (3, 1, 7) and V_3 = (2, 5, 8) are linearly dependent or linearly independent.	7	L2	CO3
	b.	Find the dimension and basis of the subspace spanned by the vectors (2, 4, 2), (1, −1, 0), (1, 2, 1) and (0, 2, 1) in $V_3(R)$	7	L2	CO3
	c.	Verify the rank-nullity theorem for the linear transformation T : $V_3(R) \rightarrow V_3(R)$ defined by T(x, y, z) = (x +2y − z, y + z, x + y − 2z).	6	L2	CO3
		Module – 4			
Q.7	a.	Find the root of the equation $xe^x = 2$ that lies between 0 and 1. Using Regula- Falsi method. Carryout Four iterations. Correct to 3 – decimal places.	7	L2	CO4
	b.	Use Newton's divided difference formula. Find f(q), given the data : 	x	:	5	7	11	13	17
f(x)	:	150	392	1452	2366	5202		7	L3	CO4
	c.	Evaluate $\int_0^1 \dfrac{dx}{1+x^2}$ by using Simpson's $\dfrac{1}{3}^{rd}$ rule taking 4 equal parts.	6	L3	CO4
		OR			
Q.8	a.	Find the real root of the equation $3x - \cos x - 1 = 0$. Correct to 3-decimal places. Using Newton's Raphson method carryout 3 – iteration.	7	L2	CO4
	b.	Find Tan(0.26) given that Tan (0.10) = 0.1003 Tan (0.15) = 0.1511, Tan (0.20) = 0.2077, Tan (0.25) = 0.2553, Tan(0.30) = 0.3093. Using Newton's Backward interpolation formula.	7	L2	CO4
	c.	Evaluate $\int_4^{5.2} \log x \, dx$ taking 6 equal parts. Using Simpson's 3/8th rule.	6	L2	CO4

		Module – 5			
Q.9	a.	Employ Taylor's series method find y at x = 0.1 and 0.2 given that $\dfrac{dy}{dx} = 2y + 3e^x$; y(0) = 0. Up to fourth degree terms.	7	L2	CO4
	b.	Using Runge Kutta a method of forth order to find an approximate value of y(0.2) given that $\dfrac{dy}{dx} = (x^2 + y)$ with y(0) = 1. Taking h = 0.2.	7	L2	CO4
	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.	6	L2	CO4
		OR			
Q.10	a.	Using modified Euler method find y(0.1) given that $\dfrac{dy}{dx} = (x + y)$, with y(0) = 1, Taking h = 0.1. Carryout 3-modification.	7	L2	CO4
	b.	Using Runge kutta method of fourth order, find the value of (0.2). Given that $\dfrac{dy}{dx} = \left(3x + \dfrac{y}{2}\right)$ with y(0) = 1. Taking h = 0.2.	7	L2	CO4
	c.	Using Mathematical tools, write the code solve the differential equation $\dfrac{dy}{dx} = 3e^x + 2y$ with y(0) = 0, using the Taylor's series method at x = 0.1 (0.1) 0.3.	6	L3	CO5

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