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Course Code

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Second Semester B.E. Degree Examinations, July 2026
APPLIED MATHEMATICS FOR CSE STREAM-II

Duration: 3 hrs

Max. Marks: 100

- Note:**
1. Answer any FIVE full questions, choosing ONE full question from each module.
 2. Use of Mathematics Formula Handbook is permitted
 3. Missing data, if any, may be suitably assumed

<u>Q. No</u>	<u>Question</u>	<u>Marks</u>	<u>(RBT:CO: PI)</u>												
<u>Module-1</u>															
1.	a. Find a real root of the equation $\cos x - 1.3x = 0$ correct to five decimal places using bisection method in three stages.	06	(2 :1: 1.2.1)												
	b. Use the Regula falsi method to obtain a root of the equation $2x - \log_{10} x = 7$ which lies between 3.5 and 4. Carry out three iterations.	07	(2 :1: 1.2.1)												
	c. Use Newton-Raphson method to find the real root of the equation $x \sin x + \cos x = 0$ near $x = \pi$. Carry out three iterations.	07	(2:1: 1.2.1)												
(OR)															
2.	a. Find the Relative error and Percentage error if $\frac{2}{3}$ approximate to 0.667.	06	(2 :1: 1.2.1)												
	b. The power dissipated in a resistor given $P = \frac{E^2}{R}$ Find the approximate Percentage error is P . When percentage error of E is increased 3% and percentage error of R is decreased by 2% .	07	(2 :1: 1.2.1)												
	c. If $R = 10x^3y^2z^2$ and error in x,y,z are 0.03,0.01,0.02 respectively at $x = 3,y = 1,z = 2$. Find Absolute, Percentage and Relative error in R .	07	(2 :1: 1.2.1)												
<u>Module-2</u>															
3.	a. Given $\sin 45^\circ = 0.7071, \sin 50^\circ = 0.7660, \sin 55^\circ = 0.8192, \sin 60^\circ = 0.8660$, find $\sin 57^\circ$ using an appropriate interpolation formula.	06	(2 :2: 1.2.1)												
	b. Find $f(9)$ from the data by Newton's divided difference formula	07	(2 :2: 1.2.1)												
	<table><tr><td>x</td><td>5</td><td>7</td><td>11</td><td>13</td><td>17</td></tr><tr><td>$f(x)$</td><td>150</td><td>392</td><td>1452</td><td>2366</td><td>5202</td></tr></table>	x	5	7	11	13	17	$f(x)$	150	392	1452	2366	5202		
x	5	7	11	13	17										
$f(x)$	150	392	1452	2366	5202										
	c. Use Lagrange's interpolation formula to find $f(4)$ given	07	(2 :2: 1.2.1)												
	<table><tr><td>x</td><td>0</td><td>2</td><td>3</td><td>6</td></tr><tr><td>$f(x)$</td><td>-4</td><td>2</td><td>14</td><td>158</td></tr></table>	x	0	2	3	6	$f(x)$	-4	2	14	158				
x	0	2	3	6											
$f(x)$	-4	2	14	158											
(OR)															

4. a. By using Simpson's $1/3^{\text{rd}}$ rule evaluate $\int_0^6 \frac{dx}{1+x^2}$ by considering seven ordinates. 06 (2 :2: 1.2.1)
- b. Evaluate $\int_0^3 \frac{dx}{(1+x)^2}$ Simpson's $3/8$ th rule by taking 6 sub intervals. 07 (2 :2: 1.2.1)
- c. Evaluate by using Weddle's rule $\int_0^1 \frac{dx}{(1+x)^2}$ by taking six equal strips. 07 (2 :2: 1.2.1)

Module-3

5. a. Use Taylor's series method to find $y(4.1)$ given that $\frac{dy}{dx} = \frac{1}{x^2+y}$ and $y(4) = 4$. consider terms up to the second degree. 06 (2 :3: 1.2.1)
- b. Apply Modified Euler's method find $y(0.1)$ correct to four decimal places solving the equation $\frac{dy}{dx} = x - y^2$, $y(0)=1$ taking $h=0.1$. 07 (2 :3: 1.2.1)
- c. Given $\frac{dy}{dx} = 3x + \frac{y}{2}$, $y(0) = 1$, compute $y(0.2)$ by taking $h=0.2$ using R-K method of fourth order. 07 (2 :3: 1.2.1)

(OR)

6. a. Given that $\frac{dy}{dx} = x - y^2$ and the data $y(0) = 0$, $y(0.2) = 0.02$, $y(0.4) = 0.0795$, $y(0.6) = 0.1762$. Compute y at $x=0.8$ by applying Milne's method. 06 (2 :3: 1.2.1)
- b. Apply Milne's predictor-corrector formula to find $y(0.4)$ using the values $y(0)=1$, $y(0.1)=1.1113$, $y(0.2)=1.2507$, $y(0.3)=1.426$, given that $\frac{dy}{dx} = x^2 + y^2$. Write the answer approximating correct to four decimal places. 07 (2 :3: 1.2.1)
- c. If $\frac{dy}{dx} = 2e^x - y$, $y(0) = 2$, $y(0.2) = 2.040$ and $y(0.3) = 2.090$, find $y(0.4)$ corrects to four decimal places by using Adams – Bashforth predictor-corrector method. (Apply the corrector formula twice). 07 (2 :3: 1.2.1)

Module-4

7. a. Show that the vectors $(5,9,5)$ is a linear combination of the vectors $(2,1,4)$, $(1,-1,3)$ and $(3,2,5)$. 06 (2 :4: 1.2.1)
- b. Show the vector $(1,2,1), (1,-1,2), (2,1,0)$ span $V_3(R)$. 07 (2 :4: 1.2.1)
- c. Show that the set of vectors $S = \{(1,1,2), (-3,1,0), (1,-1,1), (1,2,-3)\}$ are linearly independent 07 (2 :4: 1.2.1)

(OR)

8. a. Find the basis and dimension of the subspace of V spanned by the following vectors. $\{(1,2,3,2), (2,3,5,1), (1,3,4,5)\}$. 06 (2 :4: 1.2.1)

- b. Find the basis and dimension of the subspace of V spanned by the following vectors. $\{(2, -1, -3, -1), (1, 2, 3, -1), (1, 0, 1, 1), (0, 1, 1, -1)\}$. 07 (2 :4: 1.2.1)
- c. Find the basis and dimension of the subspace of V spanned by the following vectors. $\{(1, 1, 1, 9), (2, 5, 7, 52), (2, 1, -1, 0)\}$. 07 (2 :4: 1.2.1)

Module-5

9. a. Show that the transformation $T: V_2(R) \rightarrow V_2(R)$ defined by $T(x, y) = (x + y, x - y)$ is a linear transformation. 06 (2 :5: 1.2.1)
- b. Show that the transformation $T: V_3(R) \rightarrow V_2(R)$ defined by $T(x, y, z) = (y - x, y - z)$ is a linear transformation. 07 (2 :5: 1.2.1)
- c. If T_1 and T_2 are two LTs from $V_3(R)$ to $V_2(R)$ defined by $T_1(x, y, z) = (2x + y, y + 2z)$ and $T_2(x, y, z) = (y + 2z, 2z + x)$, determine $T_1 + T_2$ and $3T_1 - 2T_2$. 07 (2 :5: 1.2.1)

(OR)

10. a. Find the range, null space, rank, nullity in the case of the following linear transformations. Also verify the rank, nullity theorem $T: V_3(R) \rightarrow V_2(R)$ defined by $T(x, y, z) = (y - x, y - z)$. 06 (2 :5: 1.2.1)
- b. Find the range, null space, rank, nullity in the case of the following linear transformations. Also verify the rank, nullity theorem $T: V_2(R) \rightarrow V_3(R)$ defined by $T(1, 2) = (15, -20, 5)$ and $T(2, 1) = (12, -16, 4)$. 07 (2 :5: 1.2.1)
- c. Show that the pairs of vectors are orthonormal $a = (1/\sqrt{2}, 1/\sqrt{2}, 0, 0)$; $b = (-\sqrt{2}/6, \sqrt{2}/6, 0, 2\sqrt{2}/3)$. 07 (2 :5: 1.2.1)

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