

Basavarajeswari Group of Institutions

BALLARI INSTITUTE OF TECHNOLOGY & MANAGEMENT
 (Autonomous Institute under Visvesvaraya Technological University, Belagavi)

2025 SCHEME

USN

--	--	--	--	--	--	--	--	--	--

Course Code

1	B	M	A	T	M	2	0	1
---	---	---	---	---	---	---	---	---

Second Semester B.E. Degree Examinations, July 2026
APPLIED MATHEMATICS FOR ME 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>(RBTL:CO: PI)</u>														
<u>Module-1</u>																	
1.	a. Use the Regula Falsi method to find the real root of the equation $x^3 - 2x - 5 = 0$ correct to three decimal places.	06	(2 :1: 1.2.1)														
	b. Show that a root of the equation $x^3 + 5x - 11 = 0$ lies between 1 and 2. Find the root by Newton-Raphson method (Carry out 3 iterations).	07	(2 :1: 1.2.1)														
	c. Find $f(2.5)$ by using Newton's backward interpolation formula given that $f(0) = 7.4720$, $f(1) = 7.58545$, $f(2) = 7.6922$, $f(3) = 7.8119$, $f(4) = 7.95252$.	07	(2:1: 1.2.1)														
(OR)																	
2.	a. Using Newton's divided difference formula find $f(8)$ from the following data.	06	(2 :1: 1.2.1)														
	<table><tr><td>x</td><td>4</td><td>5</td><td>7</td><td>10</td><td>11</td><td>13</td></tr><tr><td>$f(x)$</td><td>48</td><td>100</td><td>294</td><td>900</td><td>1210</td><td>2028</td></tr></table>	x	4	5	7	10	11	13	$f(x)$	48	100	294	900	1210	2028		
x	4	5	7	10	11	13											
$f(x)$	48	100	294	900	1210	2028											
	b. Using Lagrange's interpolation formula compute u_4 , given $u_0 = 707, u_2 = 819, u_3 = 866, u_6 = 966$.	07	(2 :1: 1.2.1)														
	c. By using Simpson's 1/3 rd rule evaluate $\int_0^6 \frac{dx}{1+x^2}$ by considering seven ordinates.	07	(2:1: 1.2.1)														
<u>Module-2</u>																	
3.	a. Use Taylor's method to find y at x=0.1 considering terms up to the third degree given that $\frac{dy}{dx} = x^2 + y^2$ and $y(0) = 1$	06	(2 :2: 1.2.1)														
	b. Given $\frac{dy}{dx} = 1 + \frac{y}{x}$, y=2 at x=1, find y at x=1.2 taking h=0.2 by applying Modified Euler's method.	07	(2 :2: 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 :2: 1.2.1)														
(OR)																	

4. 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 :2: 1.2.1)
- b. If $\frac{dy}{dx} = 2e^x - y, y(0) = 2, y(0.1) = 2.010, y(0.2) = 2.040$ and $y(0.3) = 2.090$, find $y(0.4)$ corrects to four decimal places by using a. Milne's predictor corrector method. 07 (2 :2: 1.2.1)
- c. Given that $\frac{dx}{dy} = x - y^2$ and the data $y(0)=0, y(0.2)=0.02, y(0.4)=0.0795, y(0.6)=0.1769$. Compute y at by applying Adams-Bashforth method. 07 (2 :2: 1.2.1)

Module-3

5. a. Evaluate $\int_0^1 \int_x^{\sqrt{x}} xy dy dx$. 06 (2 :3: 1.2.1)
- b. Evaluate $\int_0^1 \int_x^{\sqrt{x}} xy dy dx$ by changing the order of integration. 07 (2 :3: 1.2.1)
- c. Find the area of ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ by double integration. 07 (2 :3: 1.2.1)
- (OR)
6. a. Prove that $\beta(m, n) = \frac{\Gamma(m) \cdot \Gamma(n)}{\Gamma(m+n)}$ 06 (2 :3: 1.2.1)
- b. Show that: $\int_0^{\pi/2} \frac{d\theta}{\sqrt{\sin \theta}} \times \int_0^{\pi/2} \sqrt{\sin \theta} d\theta = \pi$. 07 (2 :3: 1.2.1)
- c. Evaluate $\int_0^{\pi/2} \sqrt{\tan \theta} d\theta$ by expressing in terms of gamma functions. 07 (2 :3: 1.2.1)

Module-4

7. a. Find the unit vector normal to the surfaces $x^2y - 2xz + 2y^2z^4 = 10$ at $(2, 1, -1)$ 06 (2 :4: 1.2.1)
- b. Find $\text{div } \vec{F}$ and $\text{curl } \vec{F}$ where $\vec{F} = \nabla(x^3 + y^3 + z^3 - 3xyz)$ 07 (2 :4: 1.2.1)
- c. Show that $\vec{F} = \frac{xi+yj}{x^2+y^2}$ is both solenoidal and irrotational. 07 (2 :4: 1.2.1)
- (OR)
8. a. If $\vec{F} = x^2i + xyj$ evaluate $\int_C \vec{F} \cdot d\vec{r}$ from $(0,0)$ to $(1,1)$ along (i) the line $y = x$, (ii) the parabola $y = \sqrt{x}$ 06 (2 :4: 1.2.1)
- b. Evaluate $\int (3x^2 - 8y^2)dx + (4y - 6xy)dy$, by Green's theorem in a plane, where C is the boundary of the region enclosed by $y = \sqrt{x}$ and $y = x^2$ 07 (2 :4: 1.2.1)
- c. Evaluate the vector $\vec{F} = (x^2 + y^2)i - 2xyj$ by Stoke's theorem taken round the rectangle bounded by $x = 0, x = a, y = 0, y = b$ 07 (2 :4: 1.2.1)

Module-5

- | | | | | |
|----|----|---|----|---------------|
| 9. | a. | Solve $\frac{d^3 y}{dx^3} - 3 \frac{dy}{dx} + 2y = 0$ | 06 | (2 :5 1.2.1) |
| | b. | Solve $\frac{d^3 y}{dx^3} - 3 \frac{d^2 y}{dx^2} + 4y = 2 \cosh 2x$ | 07 | (2 :5: 1.2.1) |
| | c. | Solve $y'' - 4y' + 13y = \sin 2x$ | 07 | (2 :5 1.2.1) |

(OR)

- | | | | | |
|----|----|---|----|---------------|
| 10 | a. | Solve by the method of variation of parameters $(D^2 + 1)y = \sec x$ | 06 | (2 :5 1.2.1) |
| | b. | Solve $x^3 \frac{d^3 y}{dx^3} + 3x^2 \frac{d^2 y}{dx^2} + x \frac{dy}{dx} + 8y = 65 \cos(\log x)$ | 07 | (2 :5: 1.2.1) |
| | c. | Solve $(1+x)^2 \frac{d^2 y}{dx^2} + (1+x) \frac{dy}{dx} + y = \sin 2[\log(1+x)]$ | 07 | (2 :5 1.2.1) |

** ** *