CBCS SCHEME

USN | | | | | | | | | | BMATEC301/BEC301/BBM301

Third Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
AV Mathematics – III for EC/BM Engineering

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.
3. Use of Statistical tables and Mathematical handbook is permitted.

		Module – 1	M	L	C
Q.1	a.	Compute the constant term and first harmonics in the Fourier series for f(x) given by the following data: x: 0, 60, 120, 180, 240, 300, 360 f(x): 1.0, 1.4, 1.9, 1.7, 1.5, 1.2, 1.0	07	L3	CO1
	b.	Obtain a Fourier series for $f(x) = x^3$ in $(-\pi, \pi)$	07	L2	CO1
	c.	Find the Fourier half-range cosine series of the function $f(x) = (x-1)^2$ in $(0, 1)$.	06	L2	CO1
		OR			
Q.2	a.	Find the Fourier series of $f(x) = x + x^2$ in $(-\pi, \pi)$. Hence deduce that $\frac{\pi^2}{12} = \frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \ldots\ldots$	07	L2	CO1
	b.	Obtain a Fourier series expansion of $f(x) = \begin{cases} \pi x, & 0 \le x \le 1 \\ \pi(2-x), & 1 \le x \le 2 \end{cases}$	07	L2	CO1
	c.	For the periodic function f(x) of period 6 specified by the following table over the interval (0, 6), find the Fourier coefficients a_0, a_1 and b_1. x: 0, 1, 2, 3, 4, 5, 6 f(x): 9, 18, 24, 28, 26, 20, 9	06	L3	CO1
		Module – 2			
Q.3	a.	Find the Fourier transform of $f(x) = \begin{cases} a^2 - x^2, & \lvert x \rvert \le a \\ 0, & \lvert x \rvert > a \end{cases}$ where 'a' is positive constant. Hence evaluate $\int_0^\infty \frac{\sin x - x\cos x}{x^3} dx = \frac{\pi}{4}$	07	L2	CO2
	b.	Find the Fourier sine transform of $f(x) = e^{-\lvert x \rvert}$. Hence evaluate $\int_0^\infty \frac{\sin mx}{1+x^2} dx$; $m > 0$	07	L2	CO2
	c.	Find the Discrete Fourier Transform (DFT) of a sequence X(n) = {1,1,0,0} and find the IDFT of $\tau(k)$ = {1 0 1 0}	06	L3	CO2

		OR			
Q.4	a.	Find the Fourier transform of the function $f(x) = \begin{cases} 1, & \text{for } \lvert x \rvert \le a \\ 0, & \text{for } \lvert x \rvert > a \end{cases}$ Hence evaluate $\int_0^\infty \frac{\sin x}{x} dx$	07	L2	CO2
	b.	Find the Fourier sine and cosine transform of $f(x) = \begin{cases} x, & 0 < x < 2 \\ 0, & \text{else where} \end{cases}$	07	L2	CO2
	c.	Solve the Integral equation of $\int_0^\infty f(\theta)\cos\alpha\theta \, d\theta = \begin{cases} 1-\alpha, & 0 \le \alpha \le 1 \\ 0, & \alpha > 1 \end{cases}$ Hence evaluate $\int_0^\infty \frac{\sin^2 t}{t^2} dt$	06	L3	CO2
		Module – 3			
Q.5	a.	Find the z-transforms of $(2n-1)^2 + \sin 3n$.	06	L1	CO3
	b.	Find the inverse z-transform of $\frac{3z^2 + 2z}{(5z-1)(5z+2)}$	07	L3	CO3
	c.	Using z-transforms, solve the difference equation $y_{n+2} - 5y_{n+1} + 6y_n = 2$; $y_0 = 0$; $y_1 = 7$	07	L3	CO3
		OR			
Q.6	a.	Find the z-transforms of $\cos\left[\frac{n\pi}{2} + \frac{\pi}{4}\right]$	06	L1	CO3
	b.	Obtain the inverse z-transform of $\frac{4z^2 - 2z}{(z-1)(z-2)^2}$	07	L3	CO3
	c.	If $\bar{y}(z) = \frac{2z^2 + 3z + 12}{(z-1)^4}$, evaluate u_2.	07	L3	CO3
		Module – 4			
Q.7	a.	Solve : $\frac{d^2y}{dx^2} + y = \cos 2x$	06	L2	CO4
	b.	Solve : $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 3y = (e^x + 1)^2$	07	L2	CO4
	c.	Solve : $x^3\frac{d^3y}{dx^3} + 3x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} = \log x$	07	L3	CO4

OR

Q.8	**a.**	Solve : $[D^2-4D+4]y = e^{2x}+x$	**06**	**L2**	**CO4**
	b.	Solve : $(1+x)^2y''+(1+x)y'+y = 2\sin[\log(1+x)]$	**07**	**L3**	**CO4**
	c.	In an LCR circuit, the charge q on a plate of a condenser is given by $L\frac{d^2q}{dt^2}+R\frac{dq}{dt}+\frac{q}{c} = E\sin pt$ Solve the above equation.	**07**	**L3**	**CO4**

Module – 5

Q.9	**a.**	Find the equation of the least fitting straight line y = ax + b for the following data: x: 5, 10, 15, 20, 25 y: 16, 19, 23, 26, 30	**06**	**L2**	**CO5**
	b.	Compute the coefficient of correlation and the equations of the lines of regression for the data: x: 1, 2, 3, 4, 5 y: 2, 5, 3, 8, 7	**07**	**L3**	**CO5**
	c.	Ten competitors in a beauty contest are ranked by two Judges A and B in the following data: ID No.: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 Judge A: 1, 6, 5, 10, 3, 2, 4, 9, 7, 8 Judge B: 6, 4, 9, 8, 1, 2, 3, 10, 5, 7 Calculate the rank correlation coefficient.	**07**	**L3**	**CO5**

OR

Q.10	**a.**	Fit a parabola of second degree $y = a + bx + cx^2$ for the data x: 0, 1, 2, 3, 4 y: 1, 1.8, 1.3, 2.5, 2.3	**06**	**L2**	**CO5**
	b.	The lines of regression are $2x + 3y + 1 = 0$, $x + 6y - 4 = 0$. Compute $\bar{x}$, $\bar{y}$ and 'r'.	**07**	**L3**	**CO5**
	c.	Compute the rank correlation coefficient for the following data: x: 78, 36, 98, 25, 75, 82, 90, 62, 65, 39 y: 84, 51, 91, 60, 68, 62, 86, 58, 53, 47	**07**	**L3**	**CO5**

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