CBCS SCHEME

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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 : $(1+x)^2 y'' + (1+x)y' + y = 2\sin[\log(1+x)]$	**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:	**06**	**L2**	**CO5**
	b.	Compute the coefficient of correlation and the equations of the lines of regression for the data:	**07**	**L3**	**CO5**
	c.	Ten competitors in a beauty contest are ranked by two Judges A and B in the following data: Calculate the rank correlation coefficient.	**07**	**L3**	**CO5**

x	5	10	15	20	25
y	16	19	23	26	30

x	1	2	3	4	5
y	2	5	3	8	7

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

OR

Q.10	**a.**	Fit a parabola of second degree $y = a + bx + cx^2$ for the data	**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:	**07**	**L3**	**CO5**

x	0	1	2	3	4
y	1	1.8	1.3	2.5	2.3

x	78	36	98	25	75	82	90	62	65	39
y	84	51	91	60	68	62	86	58	53	47

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