CBCS SCHEME

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BMATE301/BEE301

Third Semester B.E./B.Tech. Degree Supplementary Examination, June/July 2024

Engineering Mathematics for EEE

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. *VTU Formula Hand pook is permitted.*

		Module – 1	M	L	C
Q.1	a.	Solve : $(D^3 + D^2 + D + 1)y = e^{3x+4}$.	6	L1	CO1
	b.	Solve : $(D^2 - 6D + 9)y = 1 + x + x^2$	7	L2	CO1
	c.	Solve : $(1+x^2)\frac{d^2y}{dx^2} + (1+x)\frac{dy}{dx} + y = 2\sin\log(x+1)$	7	L3	CO1
		OR			
Q.2	a.	Solve : $\frac{d^3y}{dx^3} + 6\frac{d^2y}{dx^2} + 11\frac{dy}{dx} + 6y = 0$	6	L1	CO1
	b.	Solve $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = \cos 3x$.	7	L2	CO1
	c.	Solve $x^2\frac{d^2y}{dx^2} - 3x\frac{dy}{dx} + 4y = (1+x^2)$.	7	L3	CO1
		Module – 2			
Q.3	a.	Fit by the method of least square, the straight line y = ax + b that best fits the following data :	6	L1	CO2

x	0	5	10	15	20
y	7	-11	16	20	26

		b.	Fit a parabola of the form, $y = ax^2 + bx + c$ to the following data:	7	L2	CO2

x	0	1	2	3	4	5
y	1	3	7	13	21	31

		c.	Find the co-efficient of correlation and line of regression for the following data :	7	L2	CO2

x	10	14	18	22	26	30
y	18	12	24	6	30	36

		OR			
Q.4	a.	Find a curve of best fit of the form $y = ax^b$ to the following :	6	L1	CO2

x	1	2	3	4	5
y	0.5	2	4.5	8	12.5

	b.	In a partially destroyed lab record only the lines of regression of y on x and x on y are $y = 0.516x + 33.73$ and $x - 32.52 = 0.512y + 32.52$ respectively. Calculate $\bar{x}$, $\bar{y}$ and coefficient of correlation between x and y.	**7**	**L2**	**CO2**
	c.	A random sample of recent repair jobs was selected and estimated cost and actual cost were recorded Estimated cost (x): 300, 450, 800, 250, 500, 975, 475, 400 Actual cost (y): 273, 486, 734, 297, 631, 872, 396, 457 Compute the rank correlation.	**7**	**L2**	**CO2**
		Module – 3			
Q.5	**a.**	Obtain the Fourier series of $f(x) = \frac{\pi - x}{2}$ in $0 < x < 2\pi$. Hence deduce that $\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \ldots\ldots$	**7**	**L2**	**CO3**
	b.	Expand $f(x) = x$ in half range cosine series over the interval $(0, \pi)$	**6**	**L2**	**CO3**
	c.	Obtain the constant term and coefficients of the first sine and cosine terms in the Fourier expansion of y as given in the following table : x: 0, 1, 2, 3, 4, 5 y: 9, 18, 24, 28, 26, 20	**7**	**L2**	**CO3**
		OR			
Q.6	**a.**	Obtain the Fourier series for the function $f(x) = \begin{cases} 1 + \frac{4x}{3} & \text{in } -\frac{3}{2} < x \le 0 \\ 1 - \frac{4x}{3} & \text{in } 0 \le x < \frac{3}{2} \end{cases}$	**7**	**L2**	**CO3**
	b.	Obtain the half-range sine Fourier series of $f(x) = x^2$ in $0 < x < \pi$.	**6**	**L2**	**CO3**
	c.	Obtain the first three coefficient in the Fourier cosine series for y where y is given in the following table : x: 0, 1, 2, 3, 4, 5 y: 4, 8, 15, 7, 6, 2	**7**	**L2**	**CO3**
		Module – 4			
Q.7	**a.**	Find the Fourier transform of the $f(x) = \begin{cases} 1 & \text{for } \lvert x \rvert \le a \\ 0 & \lvert x \rvert > a \end{cases}$ Hence evaluate $\int_0^\infty \frac{\sin x}{x} dx$.	**7**	**L2**	**CO4**
	b.	Obtain the Fourier cosine transform of the form, $f(x) = \begin{cases} 4x & 0 < x < 1 \\ 4 - x & 1 < x < 4 \\ 0 & x > 4 \end{cases}$	**6**	**L2**	**CO4**

	c.	Find the inverse Z-transform of, $\frac{4z^2-2z}{z^3-5z^2+8z-4}$.	7	L2	CO4
		OR			
Q.8	a.	Find the Fourier transform of, $f(x)=xe^{-\|x\|}$	7	L2	CO4
	b.	$Z(u_n)=\frac{2z^2+3z+4}{(z-3)^3}$, show that $u_0=0$, $u_1=2$, $u_2=21$	6	L2	CO4
	c.	Find the Inverse Z-transform of $u(z)=\frac{18z^2}{(2z-1)(4z+1)}$	7	L2	CO4
		Module – 5			
Q.9	a.	Find the value of K such that the following distribution represents a finite probability distribution. Hence find its mean and standard deviation. Also find $P(x\le 1), P(x>1)$ and $P(-1<x\le 2)$. x: -3, -2, -1, 0, 1, 2, 3 P(x): K, 2K, 3K, 4K, 3K, 2K, K	7	L1	CO5
	b.	2% of the fuses manufactured by a firm are found to be defective. Find the probability that a box containing 200 fuses contains : (i) No defective fuses. (ii) 3 or more defective fuses.	6	L2	CO5
	c.	Find the student's t for the following variable values in a sample of eight $-4, -2, -2, 0, 2, 2, 3, 3$ taking the mean of the universe to be zero.	7	L2	CO5
		OR			
Q.10	a.	The number of telephone lines busy at an instant of time is a binomial variate with probability 0.1 that a line is busy. If 10 lines are choosen at random, what is the probability that, (i) no line is busy (ii) all lines are busy (iii) at least one line busy (iv) atmost 2 lines are busy.	7	L3	CO5
	b.	If 'x' is an exponential variate with mean 5, evaluate (i) $P(0<x<1)$ (ii) $P(-\infty<x<10)$ (iii) $P(x\le 0 \text{ or } x\ge 1)$	6	L2	CO5
	c.	A die is thrown 264 times and the number appearing on the face (x) follows the following frequency distribution. x: 1, 2, 3, 4, 5, 6 f: 40, 32, 28, 58, 54, 60 Calculate the value of χ^2.	7	L2	CO5

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