CBCS SCHEME

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BMATE/BEE301

Third Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025
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. *Use of statistical tables and mathematics formula handbook is permitted.*
3. *M : Marks , L: Bloom's level , C: Course outcomes.*

		Module – 1	M	L	C
Q.1	a.	Solve: $(D^4 - 2D^3 + 5D^2 - 8D + 4)y = 0$	06	L2	CO1
	b.	Solve: $(D^2 - 10D + 25)y = 2e^{5x} + \cos x + 5$	07	L3	CO1
	c.	Solve: $x^2\frac{d^2y}{dx^2} - x\frac{dy}{dx} + y = 2\log x$.	07	L3	CO1
		OR			
Q.2	a.	Solve $(D^3 - 4D^2 + 5D - 2)y = 0$.	06	L2	CO1
	b.	Solve $(1+x)^2y'' + (1+x)y' + y = 2\sin\log(1+x)$	07	L3	CO1
	c.	In L-C-R circuit, the charge q on a plate of a consider is given by $L\frac{d^2q}{dt^2} + R\frac{dq}{dt} + \frac{q}{c} = E\sin pt$. The circuit is tuned to resonance so that $p^2 = \frac{1}{LC}$, if initially the current I and the charge q be zero, show that, for small values of R/L, the current in the circuit at time t is given by $\left(\frac{Et}{2L}\right)\sin pt$.	07	L3	CO1
		Module – 2			
Q.3	a.	Fit a straight line y = ax + b in the Least Square Method to the following data:	06	L2	CO2

x	50	70	100	120
y	12	15	21	25

	b.	Find the correlation coefficient and hence find the regression lines for the data:								07	L3	CO2

x	1	2	3	4	5	6	7	8	9	10
y	10	12	16	28	25	36	41	49	40	50

	c.	Given the equation of the regression lines x = 19.13 – 0.87y and y = 11.64 – 0.5x. Compute the mean of x's, mean of y's and the coefficient of correlation.								07	L3	CO2
		OR										
Q.4	a.	Fit a parabola $y = ax^2 + bx + c$ by the method of least squares for the data:								06	L2	CO2

x	2	4	6	8	10
y	3.07	12.85	31.47	57.38	91.29

	b.	Obtain the lines of Regression and hence find the coefficient of correlation for the data:								07	L3	CO2

x	1	3	4	2	5	8	9	10	13	15
y	8	6	10	8	12	16	16	10	32	32

	c.	The coefficient of rank correlation obtained by ten students in statistics and accountancy was 0.2. It was later discovered that the difference in ranks in the two subjects of one of the students was wrongly taken as 9 instead of 7. Find the correct rank correlation coefficient.	07	L2	CO2
		Module – 3			
Q.5	a.	Find the Fourier series for the function $f(x) = \|x\|$ in $(-\pi, \pi)$ and hence deduce that $\frac{\pi^2}{8} = \sum_{n=1}^{\infty} \frac{1}{(2n-1)^2}$.	06	L3	CO3
	b.	Obtain a Half Range Sine Series for the function $f(x) = \begin{cases} \frac{1}{4} - x & \text{for } 0 \le x \le \frac{1}{2} \\ x - \frac{3}{4} & \text{for } \frac{1}{2} \le x \le 1 \end{cases}$	07	L2	CO3
	c.	The following table gives the variations of a periodic current A over a period T. Show that there is a constant part of 0.75 Amp in the current A and obtain the amplitude of the first harmonic.	07	L3	CO3

t (Secs)	0	T/6	T/3	T/2	2T/3	5T/6	T
A (Amp)	1.98	1.30	1.05	1.30	–0.88	–0.25	1.98

		OR			
Q.6	a.	Expand the function $f(x) = x(2\pi - x)$ in the Fourier series over the internal $(0, 2\pi)$.	06	L3	CO3
	b.	Find the half range cosine series for the function $f(x) = \begin{cases} x, & 0 < x \le \pi/2 \\ \pi - x & \pi/2 \le x < \pi \end{cases}$	07	L2	CO3
	c.	Express y as a Fourier series upto first harmonic for the following data:	07	L3	CO3

x	0	1	2	3	4	5
y	9	18	24	28	26	20

		Module – 4			
Q.7	a.	Find the Fourier transform of the function $f(x) = \begin{cases} 1 & \text{for } \|x\| \le a \\ 0 & \text{for } \|x\| > a \end{cases}$ and hence evaluate $\int_0^{\infty} \frac{\sin x}{x} dx$	06	L3	CO4
	b.	Find the Fourier sine transform of $\frac{e^{-ax}}{x}$, $a > 0$	07	L2	CO4
	c.	Find the Z – transform of $\cos\left(\frac{n\pi}{2} + \frac{\pi}{4}\right)$.	07	L2	CO4
		OR			
Q.8	a.	Find the Fourier transform of $f(x) = e^{-\|x\|}$.	06	L2	CO4
	b.	Find the inverse Z-transform of $\frac{z^2}{(z-1)(z+3)}$	07	L2	CO4
	c.	Solve the difference equation $y_{n+2} - 4y_n = 0$, given that $y_0 = 0$ and $y_1 = 2$.	07	L3	CO4

Module – 5

Q.9	**a.**	The probability density function of a variable x is given by the following table: x | 0 | 1 | 2 | 3 | 4 | 5 | 6 p(x) | K | 3K | 5K | 7K | 9K | 11K | 13K for what value of K this represents a valid probability distribution? Also find $P(x \geq 5)$ and $P(3 < x \leq 6)$.	**06**	**L2**	**CO5**
	b.	If the mean and standard deviation of the number of correctly answered questions in a test given to 4096 students are 2.5 and $\sqrt{1.875}$. Find an estimate number of candidates answering correctly: (i) 8 or more questions (ii) 2 or less (iii) 5 questions	**07**	**L3**	**CO5**
	c.	In a normal distribution 31% of the items are under 45 and 8% of the items are over 64. Find the mean and standard deviation of the distribution.	**07**	**L3**	**CO5**
		OR			
Q.10	**a.**	Explain the terms: (i) Type I and Type II error (ii) Alternative hypothesis (iii) Significance level	**06**	**L1**	**CO5**
	b.	A certain stimulus administered to each of the 12 patients resulted in the following change in blood pressure 5, 2, 8, –1, 3, 0, 6, –2, 1, 5, 0, 4. Can it be concluded that the stimulus will increase the blood pressure. $[t_{0.05}(11) = 2.201]$	**07**	**L3**	**CO5**
	c.	4 coins are tossed 100 times and the following results were obtained. Fit a binomial distribution for the data and test the goodness of fit. $[\chi^2_{0.05} = 9.49]$	**07**	**L3**	**CO5**

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