CBCS SCHEME

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BMATE301/BEE301

Third Semester B.E./B.Tech. Degree Examination, June/July 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. M : Marks , L: Bloom's level , C: Course outcomes.
3. Use of Mathematics Handbook is permitted.

		Module – 1	M	L	C
Q.1	**a.**	Solve : $(D^3 - 2D^2 + 4D - 8)y = 0$.	**06**	**L2**	**CO1**
	b.	Solve : $(D^2 - 4)y = \cosh(2x-1) + 3^x$.	**07**	**L2**	**CO1**
	c.	Solve : $x^3\frac{d^3y}{dx^3} + 3x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + 8y = 65\cos(\log x)$.	**07**	**L2**	**CO1**
		OR			
Q.2	**a.**	Solve : $(4D^4 - 8D^3 - 7D^2 + 11D + 6)y = 0$.	**06**	**L2**	**CO1**
	b.	Solve : $(D^2 - 6D + 25)y = e^{2x} + \sin x + 4$.	**07**	**L2**	**CO1**
	c.	Solve : $(2x+1)^2 y'' - 6(2x+1)y' + 16y = 8(2x+1)^2$.	**07**	**L2**	**CO1**
		Module – 2			
Q.3	**a.**	Fit a least square geometric curve $y = ax^b$ for the following data : x: 350, 400, 500, 600 y: 61, 26, 7, 2.6	**06**	**L2**	**CO2**
	b.	Calculate the coefficient of correlation and obtain the lines of regression for the following data : x: 1, 3, 4, 6, 8, 9, 11, 14 y: 1, 2, 4, 4, 5, 7, 8, 9	**07**	**L2**	**CO2**
	c.	Compute $\bar{x}$, $\bar{y}$ and r from the following equation of the regression lines $2x + 3y + 1 = 0$, $x + 6y - 4 = 0$	**07**	**L2**	**CO2**
		OR			
Q.4	**a.**	If θ is the angle between the lines of regression then show that, $\tan\theta = \frac{\sigma_x\sigma_y}{\sigma_x^2 + \sigma_y^2}\left(\frac{1-r^2}{r}\right)$.	**06**	**L2**	**CO2**
	b.	Fit a parabola $y = a + bx + cx^2$ for the data : x: 0, 1, 2, 3, 4 y: 1, 1.8, 1.3, 2.5, 6.3	**07**	**L2**	**CO2**
	c.	Compute the rank correlation coefficient for the following data : x: 68, 64, 75, 50, 64, 80, 75, 40, 55, 64 y: 62, 58, 68, 45, 81, 60, 68, 48, 50, 70	**07**	**L2**	**CO2**

		Module – 3			
Q.5	**a.**	Obtain the Fourier Series Expansion for, $f(x)=\frac{\pi-x}{2}$ in $0\le x\le 2\pi$.	**06**	**L2**	**CO3**
	b.	Find the half range Fourier cosine series for the function $f(x)=(x-1)^2$ in $0<x<1$ and hence show that, $\frac{\pi^2}{8}=\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+.....$	**07**	**L2**	**CO3**
	c.	Find the Fourier series expansion upto first harmonic if it is given by, x: 0 1 2 3 4 5 f(x): 9 18 24 28 26 20	**07**	**L3**	**CO3**
		OR			
Q.6	**a.**	Obtain the Fourier Series expansion of, $f(x)=\lvert x\rvert$, $-\pi\le x\le\pi$.	**06**	**L2**	**CO3**
	b.	Obtain the half range sine series of, $f(x)=\begin{cases}x & 0\le x\le\frac{\pi}{2}\\ \pi-x & \frac{\pi}{2}<x\le\pi\end{cases}$	**07**	**L2**	**CO3**
	c.	Express y as Fourier series upto first harmonic for the following data : x: 0, $\frac{\pi}{6}$, $\frac{\pi}{3}$, $\frac{\pi}{2}$, $\frac{2\pi}{3}$, $\frac{5\pi}{6}$ y: 1.98, 1.30, 1.05, 1.30, -0.88, -0.25	**07**	**L3**	**CO3**
		Module – 4			
Q.7	**a.**	Find the Fourier transform of, $f(x)=\begin{cases}1-\lvert x\rvert & \text{for } \lvert x\rvert\le 1\\ 0 & \text{for } \lvert x\rvert>1\end{cases}$.	**06**	**L2**	**CO4**
	b.	Find the Fourier cosine transform of e^{-ax} and xe^{-ax} where a > 0. Deduce that $\int_0^\infty \frac{\cos mx}{x^2+a^2}dx=\frac{\pi}{2a}e^{-am}$.	**07**	**L2**	**CO4**
	c.	Obtain z-transform of $\cosh n\theta$ and $\sinh n\theta$.	**07**	**L3**	**CO4**
		OR			
Q.8	**a.**	Find the Fourier sine transform of $\frac{e^{-ax}}{x}$, a > 0.	**06**	**L2**	**CO4**
	b.	Find the inverse z-transform of $\frac{8z-z^3}{(4-z)^3}$.	**07**	**L2**	**CO4**
	c.	Solve the difference equation, $y_{n+1}+\frac{1}{4}y_n=\left(\frac{1}{4}\right)^n$.	**07**	**L3**	**CO4**

Module – 5

Q.9 **a.** In a quiz contest of answering 'yes' or 'no' : what is the probability of guessing atleast 6 answers correctly out of 10 questions asked? Also find the probability of the same if there are 4 options for a correct answer. **06** **L2** **CO5**

b. Fit a Poisson's distribution for the following data and calculate the theoretical frequencies : **07** **L2** **CO5**

x	0	1	2	3	4
f	122	60	15	2	1

c. Ten individuals are chosen at random from the population and their height's in inches are found to be 63, 63, 66, 67, 68, 69, 70, 70, 71, 71. Test the hypothesis that mean height of the universe is 66 inches. $(t_{0.05} = 2.262 \text{ for } 9 \text{ d.f.})$ **07** **L2** **CO5**

OR

Q.10 **a.** A random variable X has the following probability function for various values : **06** **L2** **CO5**

x	0	1	2	3	4	5	6	7
P(x)	0	K	2K	2K	3K	K^2	$2K^2$	$7K^2+K$

(i) Find K

(ii) Evaluate P(x<6), $P(x \geq 6)$ and $P(3 < x \leq 6)$

b. In a test on electric bulbs, it was found that the life time of a particular brand was distributed normally with an average life of 2000 hours and standard deviation of 60 hours. If a firm purchases 2500 bulbs, find the number of bulbs that are likely to last for, **07** **L2** **CO5**

(i) More than 2100 hrs

(ii) Less than 1950 hrs.

(iii) Between 1900 to 2100 hours.

c. A sample of examination result of 500 students was made. It was found that 220 students had failed, 170 had secured third class, 90 had secured second class and 20 had secured first class. Do these figures support the general examination results which is in the ratio 4 : 3 : 2 : 1 for respective categories. $(\chi^2_{0.05} = 7.81 \text{ for } 3 \text{ d.f.})$ **07** **L2** **CO5**

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