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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. VTU Formula Hand Book is permitted.
3. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Solve : $[4D^4 - 4D^3 - 23D^2 + 12D + 36]y = 0$	6	L1	CO1
	b.	Solve : $(D^2 - 4D + 4)y = e^{2x} + \cos 2x + 5$	7	L2	CO1
	c.	Solve : $(2x+1)^2 y'' - 6(2x+1)y' + 16y = 8(2x+1)^2$	7	L3	CO1
		OR			
Q.2	a.	Solve : $(4D^4 - 8D^3 - 7D^2 + 11D + 6)y = 0$	6	L1	CO1
	b.	Solve : $(D^2 + 4)y = x^2 + \sin 2x + 2^{-x}$	7	L2	CO1
	c.	Solve : $x^3y''' + 3x^2y'' + xy' + 8y = 65\cos(\log x)$	7	L3	CO1
		Module – 2			
Q.3	a.	Fit a curve of the form $y = a + bx + cx^2$ to the following data: x: 0 1 2 3 4 5 y : 1 3 7 13 21 31	6	L2	CO2
	b.	Calculate the co-efficient of correlation and obtain the lines of regression for the following data: x : 3 5 6 9 10 12 15 20 22 28 y : 10 12 15 18 20 22 27 30 32 34	7	L3	CO2
	c.	Ten students got the following percentage of marks in two subjects x and y. Compute their rank correlation coefficient: Marks in x: 78 36 98 25 75 82 90 62 65 39 Marks in y: 84 51 91 60 68 62 86 58 53 47	7	L3	CO2
		OR			
Q.4	a.	Fit a curve of the form $y = ax^b$ to the given data x: 1 2 3 4 5 6 y: 2.98 4.26 5.21 6.1 6.8 7.5	6	L2	CO2
	b.	Given that $8x - 10y + 66 = 0$ and $40x - 18y - 214 = 0$ are the regression equations. Calculate : i) Mean value of x's and y's ii) Correlation coefficient iii) Find σ_y if σ_x =	7	L3	CO2
	c.	Compute the rank correlation co-efficient 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	7	L3	CO2

Module – 3

Q.5	a.	Obtain the Fourier series of the function $f(x)=\left(\frac{\pi-x}{2}\right)^2$ over the interval $0<x<2\pi$. Hence deduce thai $\frac{\pi^2}{12}=\frac{1}{1^2}-\frac{1}{2^2}+\frac{1}{3^2}-\frac{1}{4^2}+....$	6	L3	CO3
	b.	Expand the function $f(x)=(x-1)^2$ in $0\le x\le 1$ in the half range cosine series. Hence deduce that $\frac{\pi^2}{8}=\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+....$	7	L3	CO3
	c.	Find the constant term and the first harmonic in the Fourier series for f(X) given by the table x: 0 1 2 3 4 5 6 y: 9 18 24 28 26 20 9	7	L2	CO3
		OR			
Q.6	a.	Expand the function $f(x)=\begin{cases}1+2x, & \text{in } -3<x\le 0\\ 1-2x, & \text{in } 0\le x<3\end{cases}$ as a Fourier series and deduce that $\frac{\pi^2}{8}=\sum_{n=1}^{\infty}\frac{1}{(2n-1)^2}$.	6	L3	CO3
	b.	Obtain the cosine half-range series for the function $f(x) = x(\pi - x)$ in the interval $(0, \pi)$. Deduce that $\frac{\pi^2}{6}=\sum_{n=1}^{\infty}\frac{1}{n^2}$	7	L3	CO3
	c.	Obtain the Fourier series for f(x) upto the first harmonic given by the table x: 0 $\frac{\pi}{3}$ $\frac{2\pi}{3}$ π $\frac{4\pi}{3}$ $\frac{5\pi}{3}$ 2π f(x): 7.9 7.2 3.6 0.5 0.9 6.8 7.9	7	L2	CO3
		Module – 4			
Q.7	a.	Find the Fourier transform of the function, $f(x)=\begin{cases}1-x^2, & |x|<1\\ 0, & |x|\ge 1\end{cases}$. Hence evaluate the integrals $\int_0^{\infty}\frac{x\cos x-\sin x}{x^3}dx$.	6	L3	CO4
	b.	Find the Fourier sinc transform of $f(x)=e^{-|x|}$ and hence evaluate $\int_0^{\infty}\frac{x\sin mx}{1+x^2}dx$, $m>0$	7	L2	CO4
	c.	Find the inverse Z-transform of $\frac{2z^2+3z}{(z+2)(z-4)}$.	7	L2	CO4

OR

Q.8	a.	Find the Fourier sine transform of $\frac{e^{-ax}}{x}$, $a > 0$.	6	L2	CO4
	b.	Find the Z-transform of the following : i) Sin $(3n + 5)$ ii) $(2n - 1)^2$.	7	L2	CO4
	c.	Solve the difference equation : $U_{n+2} - 3U_{n+1} + 2U_n = 0$ given that $U_0 = 0$, $U_1 = -1$.	7	L3	CO4

Module – 5

Q.9	a.	The probability distribution of a random variable X is given by the table : x: –3, –2, –1, 0, 1, 2, 3 P(x): K, 2K, 3K, 4K, 3K, 2K, K Find : i) The value of K ii) The mean of the distribution Also find $P(x \leq 1)$, $P(x > 1)$, $P(-1 < x \leq 2)$.	6	L2	CO5
	b.	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 chosen at random. What is the probability that : i) No line is busy ii) All lines are busy iii) Atleast one line is busy iv) Atmost line are busy.	7	L2	CO5
	c.	The marks of 1000 students in an examination follows a normal distribution with mean 70 and standard deviation 5. Find the number of students whose marks will be : i) Less than 65 ii) More than 75 iii) Between 65 and 75.	7	L3	CO5

OR

Q.10	a.	Define : i) Null hypothesis ii) Alternate hypothesis iii) Type-I and Type-II errors iv) Level of significance.	6	L1	CO5
	b.	Two horses A and B tested according to the time (in seconds) to run a particular race with the following results. Horse A : 28, 30, 32, 33, 33, 29, 34 Horse B : 29, 30, 30, 24, 27, 29 Test whether there is discriminate between the two horses. [Given $t_{0.05}$ for 11 d.f = 2.2].	7	L2	CO5
	c.	A sample analysis of examination results 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 result which is in the ratio 4 : 3 : 2 : 1 for the respective categories [Given $\chi^2_{0.05} = 7.81$ for 3 d.f].	7	L2	CO5

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