

CBCS SCHEME

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BEE/BMATE301

Third Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026 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 Handbook is permitted.*

Module – 1			M	L	C																					
Q.1	a.	Solve $(D^4 + 8D^2 + 16)y = 0$.	6	L2	CO1																					
	b.	Solve $x^2y'' - 3xy' + 5y = 3 \sin(\log x)$.	7	L2	CO1																					
	c.	Solve $y'' - 4y' + 4y = 8 \cos 2x$.	7	L2	CO1																					
OR																										
Q.2	a.	Solve $(D^2 + 5D + 6)y = x^2$	6	L2	CO1																					
	b.	Solve $(1 + x)^2 y'' + (1 + x)y' + y = 2 \sin(\log(1 + x))$.	7	L3	CO1																					
	c.	Solve $(D^2 - 3D + 2)y = 2 \sin hx$.	7	L2	CO1																					
Module – 2																										
Q.3	a.	Fit a Second degree parabola of the form $y = a + bx + cx^2$ to the following data : <table><tr><td>x</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>y</td><td>1</td><td>1.8</td><td>1.3</td><td>2.5</td><td>2.3</td></tr></table>	x	0	1	2	3	4	y	1	1.8	1.3	2.5	2.3	6	L2	CO2									
	x	0	1	2	3	4																				
	y	1	1.8	1.3	2.5	2.3																				
b.	Ten students got the following ranks in two subjects Maths and Physics : <table><tr><td>Maths</td><td>3</td><td>8</td><td>9</td><td>2</td><td>7</td><td>10</td><td>4</td><td>6</td><td>1</td><td>5</td></tr><tr><td>Physics</td><td>5</td><td>9</td><td>10</td><td>1</td><td>8</td><td>7</td><td>3</td><td>4</td><td>2</td><td>6</td></tr></table> Find the Rank Correlation Coefficient.	Maths	3	8	9	2	7	10	4	6	1	5	Physics	5	9	10	1	8	7	3	4	2	6	7	L3	CO2
Maths	3	8	9	2	7	10	4	6	1	5																
Physics	5	9	10	1	8	7	3	4	2	6																
c.	Fit a least geometric curve $y = ax^b$ for the data : <table><tr><td>x</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr><tr><td>y</td><td>0.5</td><td>2</td><td>4.5</td><td>8</td><td>12.5</td></tr></table>	x	1	2	3	4	5	y	0.5	2	4.5	8	12.5	7	L2	CO2										
x	1	2	3	4	5																					
y	0.5	2	4.5	8	12.5																					
OR																										
Q.4	a.	Calculate the coefficient of correlation and hence find the lines of regression : <table><tr><td>x</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td></tr><tr><td>y</td><td>9</td><td>8</td><td>10</td><td>12</td><td>11</td><td>13</td><td>14</td><td>16</td><td>15</td></tr></table>	x	1	2	3	4	5	6	7	8	9	y	9	8	10	12	11	13	14	16	15	6	L2	CO2	
	x	1	2	3	4	5	6	7	8	9																
y	9	8	10	12	11	13	14	16	15																	
b.	Fit a Straight line $y = ax + b$ for the following data : <table><tr><td>x</td><td>1</td><td>3</td><td>4</td><td>6</td><td>8</td><td>9</td><td>11</td><td>14</td></tr><tr><td>y</td><td>1</td><td>2</td><td>4</td><td>4</td><td>5</td><td>7</td><td>8</td><td>9</td></tr></table>	x	1	3	4	6	8	9	11	14	y	1	2	4	4	5	7	8	9	7	L1	CO2				
x	1	3	4	6	8	9	11	14																		
y	1	2	4	4	5	7	8	9																		

	c.	In a partially destroyed lab record, only the lines of regression of y on x and x on y are available as $4x - 5y + 33 = 0$ and $20x - 9y = 107$ respectively. Calculate i) Mean of x and y ii) Correlation coefficient between x and y.	7	L3	CO2
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Module – 3

Q.5	a.	Obtain the Fourier series of $f(x) = \frac{\pi - x}{2}$ in $0 < x < 2\pi$.	6	L2	CO3																		
	b.	Find the Half range cosine series of $f(x) = x(\ell - x)$, $0 \leq x \leq \ell$.	7	L2	CO3																		
	c.	Obtain the constant term and the first cosine and sine terms of Fourier series of y from the following data : <table><tr><td>x°</td><td>0</td><td>45</td><td>90</td><td>135</td><td>180</td><td>225</td><td>270</td><td>315</td></tr><tr><td>y</td><td>2</td><td>$\frac{3}{2}$</td><td>1</td><td>$\frac{1}{2}$</td><td>0</td><td>$\frac{1}{2}$</td><td>1</td><td>$\frac{3}{2}$</td></tr></table>	x°	0	45	90	135	180	225	270	315	y	2	$\frac{3}{2}$	1	$\frac{1}{2}$	0	$\frac{1}{2}$	1	$\frac{3}{2}$	7	L3	CO3
x°	0	45	90	135	180	225	270	315															
y	2	$\frac{3}{2}$	1	$\frac{1}{2}$	0	$\frac{1}{2}$	1	$\frac{3}{2}$															

OR

Q.6	a.	Find the Fourier series expansion of the function : $f(x) = \begin{cases} x & \text{in } (0, \pi) \\ x - 2\pi & \text{in } (\pi, 2\pi) \end{cases}$ and hence deduce that $\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \dots$	6	L2	CO3														
	b.	Obtain the Sine Half range Fourier series of $f(x) = x^2$ in $0 < x < \pi$.	7	L2	CO3														
	c.	Obtain the First Harmonic of Fourier series of $f(x)$ from the given data : <table border="1"><tr><td>x</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr><tr><td>y</td><td>9</td><td>18</td><td>24</td><td>28</td><td>26</td><td>20</td></tr></table>	x	0	1	2	3	4	5	y	9	18	24	28	26	20	7	L3	CO3
x	0	1	2	3	4	5													
y	9	18	24	28	26	20													

Module – 4

Q.7	a.	Find the Complex Fourier transform of $f(x) = \begin{cases} 1 & x \leq a \\ 0 & x > a \end{cases}$ Hence evaluate $\int_0^\infty \frac{\sin x}{x} dx$	6	L2	CO4
	b.	Find the Fourier Sine transform of $f(x) = \frac{e^{-ax}}{x}$, $a > 0$	7	L2	CO4
	c.	Find the Z-transform of the following : i) $\sin(3n + 5)$ ii) $(2n - 1)^2$	7	L2	CO4

OR

Q.8	a.	Solve by using Z – transform $Y_{n+2} - 4Y_n = 0$ given that $Y_0 = 0, Y_1 = 2$.	6	L2	CO4																	
	b.	Find the Fourier Sine and Cosine transform of $f(x) = \begin{cases} x & 0 < x < 2 \\ 0 & \text{otherwise} \end{cases}$	7	L3	CO4																	
	c.	Find the inverse Z transform of $\frac{5z}{(2 - z)(3z - 1)}$	7	L3	CO4																	
Module – 5																						
Q.9	a.	Find the Mean and Variance of the probability distribution of the following table : <table><tr><td>x</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr><tr><td>f(x)</td><td>0.2</td><td>0.35</td><td>0.25</td><td>0.15</td><td>0.05</td></tr></table>	x	1	2	3	4	5	f(x)	0.2	0.35	0.25	0.15	0.05	6	L2	CO5					
	x	1	2	3	4	5																
	f(x)	0.2	0.35	0.25	0.15	0.05																
b.	Given that 2% of the fuses manufactured by a firm are defective. Find the probability that a box containing 200 fuses has i) atleast one defective ii) 3 or more defective.	7	L2	CO5																		
c.	Define the terms : i) Type I and Type II error ii) Confidence interval iii) Level of significance.	7	L1	CO5																		
OR																						
Q.10	a.	In a normal distribution 31% of the items are under 45 and 8% are over 64. Find the mean and standard deviation. Given $A(0.5) = 0.19$ and $A(1.4) = 0.42$.	6	L3	CO5																	
	b.	Ten individuals are choosen at random from a population and their heights in inches are found to be 63, 63, 66, 67, 68, 69, 70, 70, 71, 71. Test the Hypothesis that the mean height of the universe is 66 inches [$t_{0.05} = 2.262$] for 9 d.f.	7	L3	CO5																	
	c.	The following table gives the number of accidents that occurred in a large city during the various days of a week. Find whether accidents are uniformly distributed over the week. <table><tr><td>Day</td><td>Sun</td><td>Mon</td><td>Tue</td><td>Wed</td><td>Thur</td><td>Fri</td><td>Sat</td><td>Total</td></tr><tr><td>No. of Accidents</td><td>14</td><td>16</td><td>8</td><td>12</td><td>11</td><td>9</td><td>14</td><td>84</td></tr></table> [The number of degrees of freedom for χ^2 is 6.]	Day	Sun	Mon	Tue	Wed	Thur	Fri	Sat	Total	No. of Accidents	14	16	8	12	11	9	14	84	7	L3
Day	Sun	Mon	Tue	Wed	Thur	Fri	Sat	Total														
No. of Accidents	14	16	8	12	11	9	14	84														
