K. J. Somaiya Institute of Engineering and Information Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)
End Semester Exam
Nov – Dec 2021
(B. Tech) Program: Computer/I.T./AIDS Engineering
Examination: SY Semester: III
Course Code: 1UCEC301/1UITC301/1UAIC301
Course Name: Applications of Mathematics in Engineering-I

Duration: 03 Hours

Max. Marks: 60

Instructions:
(1) All questions are compulsory.
(2) Draw neat diagrams wherever applicable.
(3) Assume suitable data, if necessary.

Q. No.	Question	Max. Marks	CO	BT Level
Q 1	Solve any six questions out of eight:	12		
i)	Evaluate $\int_0^\infty e^{-3t}t^5 dt$	2	CO1	3
ii)	Find Inverse L.T. of $\frac{3}{9s^2-16}$	2	CO2	3
iii)	In the Fourier series of $f(x) = \begin{cases} sinx, & 0 \le x \le \pi \\ 0, & \pi \le x \le 2\pi \end{cases}$ then find the value of the Fourier Coefficient a_1	2	CO3	3
iv)	If $v(x,y) = 2xy$ is the imaginary part of an analytic function $f(z) = u(x,y) + iv(x,y)$, then find its corresponding harmonic conjugate is	2	CO4	3
v)	The regression lines of a sample are $x+6y = 6$ and $3x+2y =10$, find sample means $\bar{x}$ and $\bar{y}$	2	CO5	3
vi)	Find the mean of the probability distribution of the number of heads obtained in three flips of a balanced coin	2	CO6	3
vii)	If $u(x,y) = (sinx)(sinhy)$ is the real part of an analytic function $f(z)= u+iv$, then $f(z)$ is equal to	2	CO4	3
viii)	Find $L[(sin3t)(sin5t)]$	2	CO1	3
Q.2	Solve any four questions out of six.	16		
i)	Find L.T. of the following function $te^{-4t}sin3t$	4	CO1	3

ii)	Find the inverse Laplace Transform of the following function $\frac{s+29}{(s+4)(s^2+9)}$	4	CO2	3
iii)	Find the Fourier Series for $f(x)=x;\quad -2<x<2$	4	CO3	3
iv)	Given:The imaginary part $v(x,y) = tan^{-1}\left(\frac{y}{x}\right)$, construct the analytic function $f(z)=u+iv$ in terms of z.	4	CO4	3
v)	The Regression lines of a sample are $x+6y = 6$ and $3x+2y = 10$. Find the coefficient of correlation between x and y	4	CO5	3
vi)	Find the value of k if the function $f(x) = k\,x^2(1-x^3)\ 0 \le x \le 1$ and 0 otherwise, is a probability density function	4	CO6	3
Q.3	Solve any two questions out of three.	16		
i)	Using convolution theorem find inverse Laplace transform of $\frac{s}{(s^2+1)(s^2+4)}$	8	CO2	3
ii)	Find the Fourier series of $f(x) = \begin{cases} -1, & -\pi < x < 0 \\ 1, & 0 < x < \pi \end{cases}$ .Hence deduce : $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \cdots \cdots = \frac{\pi}{4}$	8	CO3	3
iii)	Compute Karl Pearson's coefficient of correlation (r) and The Spearson's Rank correlation coefficient(R) and for the data X: 18 20 34 52 12 Y: 39 23 35 18 46	8	CO5	3
Q.4	Solve any two questions out of three.	16		
i)	Evaluate $\int_0^\infty e^{-2t}[\int_0^t \frac{1-e^{-t}}{t} dt]$ using L .T	8	CO1	3
ii)	Find the orthogonal trajectory of the family of curves $(x-1)^3 - 3xy^2 + 3y^2 = constant$	8	CO4	3
iii)	A random variable X has following probability distribution Find k, Mean, Variance and $P(x \le 2)$.	8	CO6	3

For Q.4 iii):

X	-2	-1	0	1	2	3
P(X=x)	0.1	k	0.2	2k	0.3	3k