University of Mumbai
Examination First Half 2022
Examinations Commencing from 3rd June 2022
Program: **Computer Engineering**
Curriculum Scheme: Rev2019
Examination: SE Semester III
Course Code: CSC301 and Course Name: Engineering Mathematics-III

Time: 2hour 30 minutes Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	In the Fourier series of f(x) =$\sqrt{1-cosx}$ in $(0,2\pi)$ the value of a_0 is
Option A:	$\frac{2\sqrt{3}}{\pi}$
Option B:	$\frac{6\sqrt{2}}{\pi}$
Option C:	$\frac{2\sqrt{2}}{\pi}$
Option D:	$\frac{2\sqrt{2}}{4\pi}$
2.	The formula of complex form of Fourier series for function f(x) in $(-l,l)$ is
Option A:	$\sum_{-\infty}^{\infty} C_n e^{inx}$ where $C_n = \frac{1}{2l}\int_{-l}^{l} f(x)e^{-in\pi x/l}\,dx$
Option B:	$\sum_{-\infty}^{\infty} C_n e^{in\pi x/l}$ where $C_n = \frac{1}{2l}\int_{-l}^{l} f(x)e^{-in\pi x/l}\,dx$
Option C:	$\sum_{-\infty}^{\infty} C_n e^{inx}$ where $C_n = \frac{1}{2l}\int_{-l}^{l} f(x)e^{-in\pi x/l}\,dx$
Option D:	$\sum_{-\infty}^{\infty} C_n e^{ix}$ where $C_n = \frac{1}{2l}\int_{-l}^{l} f(x)e^{-in\pi x/l}\,dx$
3.	Evaluate $\int_0^{\infty} e^{-3t}t^5 dt$
Option A:	$\frac{60}{s^5}$
Option B:	$\frac{120}{s^6}$
Option C:	$\frac{120}{729}$
Option D:	$\frac{60}{729}$
4.	If $f(z) = u + iv$ is analytic then
Option A:	u is harmonic but v may or may not be harmonic.
Option B:	v is harmonic but u may or may not be harmonic.
Option	u and v both need not be harmonic.

C:	
Option D:	u and v both harmonic.
5.	If Var(X) = 4 then Var(3x+5) is
Option A:	12
Option B:	20
Option C:	26
Option D:	36
6.	If X has the following probability distribution X: 0 1 2 $P(X = x)$: k 2k 5k Then the value of k is
Option A:	1/6
Option B:	0
Option C:	1/3
Option D:	1/8
7.	Find Inverse L.T. of $\frac{3}{9s^2-16}$.
Option A:	$\frac{1}{4}\sinh\left(\frac{3t}{4}\right)$
Option B:	$\frac{1}{4}\sin\left(\frac{3t}{4}\right)$
Option C:	$\frac{1}{4}\sinh\left(\frac{4t}{3}\right)$
Option D:	$\frac{1}{4}\sin\left(\frac{4t}{3}\right)$
8.	$L^{-1}\left[\frac{1}{s(s+4)}\right]$ is
Option A:	$\frac{1}{4}(e^{-4t}-1)$
Option B:	$\frac{1}{4}(1-e^{-4t})$
Option C:	$(e^{-4t}-1)$
Option D:	$\frac{1}{4}(e^{-4t}+1)$
9.	Find the Laplace transform of $\frac{sint}{t}$

Option A:	$cot^{-1}s$
Option B:	$cot^{-1}t$
Option C:	$tan^{-1}s$
Option D:	$tan^{-1}t$
10.	Find $L[(sin3t)(sin5t)]$
Option A:	$\frac{1}{2}\left[\frac{s}{s^2+4}+\frac{1}{s^2+64}\right]$
Option B:	$\frac{1}{2}\left[\frac{s}{s^2-4}-\frac{1}{s^2-64}\right]$
Option C:	$\frac{1}{2}\left[\frac{s}{s^2-4}-\frac{s}{s^2-64}\right]$
Option D:	$\frac{1}{2}\left[\frac{s}{s^2+4}-\frac{s}{s^2+64}\right]$

Q2	**Solve any Four out of Six** **5 marks each**
A	If $L\{\sin\sqrt{t}\}=\frac{\sqrt{\pi}}{2s\sqrt{s}}.e^{-1/(4s)}$, find $L\{\sin 2\sqrt{t}\}$.
B	If $v=3x^2y+6xy-y^3$, show that v is harmonic function and find the corresponding analytic function.
C	If the mean of the following distribution is 16. Find m,n and variance. X : 8, 12, 16, 20, 24 $P(X)$: 1/8 m n 1/4 1/12
D	Evaluate the Fourier coefficients a_0 and a_n of $f(x)=\frac{1}{2}(\pi-x)$ in $(0,2\pi)$.
E	Find $L^{-1}\left(\log\left(1+\frac{a}{s}\right)\right)$.
F	The Regression lines of a sample are x +6y = 6 and 3x+2y = 10. Find the coefficient of correlation between x and y.
Q3	**Solve any Four out of Six** **5 marks each**
A	Find the inverse Laplace transform of $\frac{s+29}{(s+4)(s^2+9)}$
B	Calculate the value of rank correlation coefficient from the following data regarding marks of 6 students in Statistics and Mathematics in a test: *Marks : Statistics* : 40, 42, 45, 35, 36, 39 *Marks : Mathematics* : 46, 43, 44, 39, 40, 43
C	By using Laplace transform, prove that $\int_0^\infty e^{-t}.\frac{\sin^2 t}{t}dt=\frac{1}{4}\log 5$

D	Evaluate the Fourier coefficients a_0 and b_3 of $f(x) = x$ in $(0, 2\pi)$.
E	Show that the function, $f(z) = sinhz$ is analytic and find $f'(z)$ in terms of z.
F	The probability density function of a random variable X is X: 0, 1, 2, 3, 4, 5, 6 P(X=x): k, 3k, 5k, 7k, 9k, 11k, 13k Find P(X<4), P(3<x≤ 6).
Q4	**Solve any Four out of Six** **5 marks each**
A	Find the Fourier series for $f(x)$ in $(0,2\pi)$ where $f(x) = \begin{cases} x, & 0 < x \le \pi \\ 2\pi - x, & \pi \le x < 2\pi \end{cases}$
B	Using convolution theorem, find the inverse Laplace transform of $\frac{1}{(s-2)^4(s+3)}$
C	State true or false with justification. "If two lines of regression are $x+3y-5=0$ and $4x+3y-8=0$, then the correlation coefficient is $+0.5$".
D	Find $L(t\, e^{-3t}\, cos2t\, cos3t)$
E	A continuous random variable has the following probability density function $f(x) = \begin{cases} \frac{x}{4} + k, 0 \le x \le 2 \\ 0, \quad elsewhere \end{cases}$ Evaluate k and P(1≤ $X \le 2$)
F	From the following data calculate Karl Pearson's coefficient of correlation (r) between X and Y. X: 18, 20, 34, 52, 12 Y: 39, 23, 35, 18, 46