University of Mumbai

Examination 2021 under cluster __ (Lead College: _)

Examinations Commencing from 15th June 2021 to 26th June 2021

Program: Computer Engineering

Curriculum Scheme: Rev 2019

Examination: SE Semester III

Course Code: CSC301 and Course Name: Engineering Mathematics III

Time: 2 hour 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.	$L[\sinh sinh\, 2t\,]$ is equal to
Option A:	$\frac{2}{s^2+4}$
Option B:	$\frac{4}{s^2-4}$
Option C:	$\frac{2}{s^2-4}$
Option D:	$\frac{4}{s^2+4}$
2.	$L[5t^3 + \cos cos\, 3t - e^{2t}]$ is equal to
Option A:	$\frac{30}{s^4} - \frac{s}{s^2+9} - \frac{1}{s-2}$
Option B:	$\frac{15}{s^4} + \frac{s}{s^2+9} - \frac{1}{s-2}$
Option C:	$\frac{15}{s^4} - \frac{s}{s^2+9} - \frac{1}{s-2}$
Option D:	$\frac{30}{s^4} + \frac{s}{s^2+9} - \frac{1}{s-2}$
3.	$L[e^{4t} \sin sin\, 3t\,]$ is equal to
Option A:	$\frac{3}{(s-4)^2+9}$
Option B:	$\frac{3}{(s+4)^2+9}$
Option C:	$\frac{3}{(s-4)^2+3}$
Option D:	$\frac{3}{(s+4)^2+3}$
4.	If $L[f(t)] = \emptyset(s)$, then $L[\frac{1}{t} f(t)]$ is equal to

Option A:	$\int_0^\infty \emptyset(s)ds$
Option B:	$\int_s^\infty \frac{\emptyset(s)}{s}ds$
Option C:	$\int_s^\infty \emptyset(s)ds$
Option D:	$\int_0^\infty \frac{\emptyset(s)}{s}ds$
5.	$L^{-1}\left[\frac{s-b}{(s-b)^2+a^2}\right]$ is equal to
Option A:	$e^{-bt}\cos cos\ at$
Option B:	$e^{bt}\cos cos\ at$
Option C:	$e^{-bt}\sin sin\ at$
Option D:	$e^{bt}\sin sin\ at$
6.	If $L\left[f_1(t)\right] = \emptyset_1(s),\quad L\left[f_2(t)\right] = \emptyset_2(s)$ then By the Convolution Theorem $L^{-1}\left[\emptyset_1(s) \bullet \emptyset_2(s)\right] =$
Option A:	$\int_0^\infty f_1(u) \bullet f_2(t-u)du$
Option B:	$\int_0^t f_1(u) \bullet f_2(u)du$
Option C:	$\int_0^t f_1(u) \bullet f_2(t-u)du$
Option D:	$\int_0^\infty f_1(u) \bullet f_2(u)du$
7.	If $L^{-1}[\emptyset(s)] = f(t)$ then $L^{-1}[\emptyset''(s)] =$
Option A:	$-\frac{1}{t}f(t)$
Option B:	$\frac{1}{t}f(t)$
Option C:	$-t^2 f(t)$
Option D:	$t^2 f(t)$
8.	$L^{-1}[\log log\ (s+a)\ ] =$

Option A:	$\frac{1}{t}e^{at}$
Option B:	$\frac{1}{t}e^{-at}$
Option C:	$-\frac{1}{t}e^{at}$
Option D:	$-\frac{1}{t}e^{-at}$
9.	If the Fourier series of $f(x)=\frac{1}{2}(\pi - x)\ in\ [0,2\pi]$ is $\frac{a_0}{2}+\sum_{n=1}^{\infty}[a_n \cos cos\, nx\ + b_n \sin sin\, nx\ ]$ then what is the value of a_0.
Option A:	0
Option B:	-1
Option C:	1
Option D:	N
10.	If the Fourier Series of $f(x)=\{-\pi \quad -\pi<x<0\ x \quad 0\leq x<\pi$ is $f(x)=\frac{-\pi}{4}+\frac{1}{\pi}\sum\frac{(-1)^n-1}{n^2}\cos cos\, nx\ +\sum\frac{1-2(-1)^n}{n}\sin sin\, nx$ then the series $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\cdots$ is equal to
Option A:	$\frac{\pi^2}{8}$
Option B:	$-\frac{\pi^2}{8}$
Option C:	$\frac{\pi^2}{4}$
Option D:	$-\frac{\pi^2}{4}$
11.	If f(x) is an even function in $(-\pi,\pi)$ then in the Fourier series expansion of f(x) in $(-\pi,\pi)$, following is true.
Option A:	$a_n=0$
Option B:	$b_n=0$
Option C:	$a_n=b_n=0$
Option D:	$a_0=b_n=0$
12.	Determine the constant 'a' if $f(z)=\left(ax^3-6xy^2+3x^2-3y^2+x\right)+i(6x^2y-2y^3+6xy+y)$ is analytic.
Option A:	3
Option B:	4
Option C:	-2
Option D:	2
13.	If $(x)=\left(x^3-3xy^2\right)+i(3x^2y-y^3)$, find it's complex derivative.
Option A:	$f'(z)=3\left(y^2-x^2\right)+i6xy$

Option B:	$f'(z) = 3(x^2 + y^2) + i6xy$
Option C:	$f'(z) = 3(x^2 - y^2) + i6xy$
Option D:	$f'(z) = 3(x^2 + y^2) - i6xy$
14.	If $f(z) = u(x,y) + iv(x,y)$ is an analytic function then select the correct option.
Option A:	Curves $u = c_1 \& v = c_2$ intersects orthogonally.
Option B:	Curves $u = c_1 \& v = c_2$ never intersects.
Option C:	Curves $u = c_1 \& v = c_2$ are straight lines.
Option D:	Curves $u = c_1 \& v = c_2$ are same.
15.	If the values of two variables deviate in the same direction then the correlation is said to be
Option A:	Linear correlation
Option B:	Zero correlation
Option C:	Negative correlation
Option D:	Positive correlation
16.	Karl Pearson's Coefficient of Correlation (r) is given by the following formula
Option A:	$\frac{E(XY)-E(X)E(Y)}{\sqrt{[E(X^2)+(E(X))^2][E(Y^2)+(E(Y))^2]}}$
Option B:	$\frac{E(XY)-E(X)E(Y)}{\sqrt{[E(X^2)-(E(X))^2][E(Y^2)-(E(Y))^2]}}$
Option C:	$\frac{E(X)E(Y)-E(XY)}{\sqrt{[E(X^2)-(E(X))^2][E(Y^2)-(E(Y))^2]}}$
Option D:	$\frac{E(XY)+E(X)E(Y)}{\sqrt{[E(X^2)+(E(X))^2][E(Y^2)+(E(Y))^2]}}$
17.	If the regression lines are $x + 6y = 6 \& 3x + 2y = 10$ find $\bar{x}, \bar{y}$.
Option A:	$\bar{x} = 3, \bar{y} = 2$
Option B:	$\bar{x} = 2, \bar{y} = 1/2$
Option C:	$\bar{x} = 3, \bar{y} = 1/2$
Option D:	$\bar{x} = 1, \bar{y} = 2$
18.	If two events A & B are independent then following statement is true.
Option A:	$P(A \cap B) = P(A) + P(B)$
Option B:	$P(A \cup B) = P(A) \cdot P(B)$
Option C:	$P(A \cap B) = P(A) \cdot P(B)$
Option D:	$P(A \cup B) = P(A) + P(B)$
19.	Suppose the probability distribution of a random variable x is given by

X	1	2	3
P(X=x)	k	$k + \frac{1}{7}$	$2k$

Obtain k.

Option A:	-3/7
Option B:	3/7
Option C:	-3/14
Option D:	3/14
20.	Suppose two fair dice are thrown and sum of the numbers on dice is noted. What is the probability that the sum can be equal to 6, 7, 8 or 9?
Option A:	2/9
Option B:	4/9
Option C:	5/9
Option D:	7/9

Subjective/descriptive questions

Q2 **(20 Marks)**	**Solve any Four out of Six5 marks each**
A	Find $L\left[\frac{\cos\cos 2t\sin\sin t}{e^t}\right]$
B	Find $L^{-1}\left\{\frac{s+2}{s^2-4s+13}\right\}$
C	Find the Fourier Series of $f(x)$ where $f(x) = x^3$ in $(-\pi, \pi)$.
D	Determine whether the function $f(z) = \left(x^3 - 3xy^2 + 3x\right) + i(3x^2y - y^3 + 3y)$ is analytic. If so find its derivative.
E	Fit a straight line to the following data x: 0, 1, 2, 3, 4 y: 1, 1.8, 3.3, 4.5, 6.3
F	The distribution function of a random variable X is given by $F(x) = 1 - (1 + x)e^{-x}$, $x \geq 0$. Obtain the probability density function (pdf) of X.

Q3 **(20 Marks)**	**Solve any Four out of Six5 marks each**
A	Find $L[\left(1 + te^{-t}\right)^3]$
B	Find $L^{-1}\left\{\frac{1}{s\left(s^2+a^2\right)}\right\}$
C	Find the half range cosine series for $f(x) = \left\{2\ 0 < x < \frac{a}{2}\ \ -\ 2\ \frac{a}{2} < x < a\right\}$
D	Show that the function $u = x^3 - 3xy^2 + 3x^2 - 3y^2 + 1$ is harmonic.
E	Compute a Spearman's coefficient of rank correlation for the given data x: 3, 6, 4, 5, 7 y: 2, 4, 5, 3, 6

<table>
<tr>
<td>F</td>
<td>A random variable X has following probability distribution
<table>
<tr><td>X</td><td>-2</td><td>0</td><td>1</td></tr>
<tr><td>P(X=x)</td><td>1/3</td><td>1/2</td><td>1/6</td></tr>
</table>
What is the moment generating function of X</td>
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Question Number	Correct Option
Q1.	C
Q2.	D
Q3.	A
Q4	C
Q5	B
Q6	C
Q7	D
Q8.	D
Q9.	A
Q10.	B
Q11.	B
Q12.	D
Q13.	C
Q14.	A
Q15.	D
Q16.	B
Q17.	C
Q18.	C
Q19.	D
Q20.	C