

University of Mumbai

Examination 2020 under cluster __ (Lead College: _____)

Examinations Commencing from 23rd December 2020 to 6th January 2021 and from 7th January 2021 to 20th January 2021

Program: Computer Engineering

Curriculum Scheme: Rev 2019

Examination: Second Year Semester III

Course Code: CSC301 and Course Name: Engineering Mathematics-3

Time: 2 hour

Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	Laplace transform of $\cos(\sqrt{3}t)$ is
Option A:	$\frac{s}{s^2 + 9}$
Option B:	$\frac{s}{s^2 - 9}$
Option C:	$\frac{s}{s^2 + 3}$
Option D:	$\frac{s}{s^2 - 3}$
2.	The value of $\int_0^\infty e^{-3t} \left(\frac{\sinh t}{t}\right) dt$ is
Option A:	$\frac{1}{3} \ln 3$
Option B:	$\frac{1}{3} \ln\left(\frac{1}{3}\right)$
Option C:	$\frac{1}{2} \ln 2$
Option D:	$\frac{1}{2} \ln\left(\frac{1}{2}\right)$
3.	Laplace transform of $f(t) = t^2 e^{-t}$ is
Option A:	$\frac{2}{(s-1)^3}$
Option B:	$\frac{2}{(s+1)^3}$

Option C:	$\frac{\Gamma(2)}{(s-1)^3}$
Option D:	$\frac{\Gamma(2)}{(s+1)^3}$
4.	Laplace transform of $\int_0^t \sin 2t \cosh 2t dt$ is
Option A:	$\frac{1}{s} \left[\frac{1}{(s-2)^2-4} - \frac{1}{(s+2)^2-4} \right]$
Option B:	$\frac{1}{s} \left[\frac{1}{(s-2)^2-4} + \frac{1}{(s+2)^2-4} \right]$
Option C:	$\frac{1}{s} \left[\frac{1}{(s-2)^2+4} - \frac{1}{(s+2)^2+4} \right]$
Option D:	$\frac{1}{s} \left[\frac{1}{(s-2)^2+4} + \frac{1}{(s+2)^2+4} \right]$
5.	Inverse Laplace transform of $\frac{s-1}{s^2}$ is
Option A:	$-1-t$
Option B:	$-1+t$
Option C:	$1+t$
Option D:	$1-t$
6.	$L^{-1} \left[\frac{s+2}{s^2+4s+5} \right]$ is
Option A:	$e^{-2t} \cos t$
Option B:	$e^{-2t} \sin t$
Option C:	$e^{2t} \cos t$
Option D:	$e^{2t} \sin t$
7.	$L^{-1}(\tan^{-1}s)$ is
Option A:	$\frac{\sin t}{t}$
Option B:	$\frac{\cos t}{t}$
Option C:	$-\frac{\sin t}{t}$
Option D:	$-\frac{\cos t}{t}$

8.	$L^{-1} \left[\frac{s(2s^2-3)}{(s^2+1)(s^2-4)} \right]$ is
Option A:	$\cosh t + \cosh 2t$
Option B:	$\cos t + \cosh 2t$
Option C:	$\cos t + \cos 2t$
Option D:	$\cosh t + \cos 2t$
9.	Fourier coefficient a_2 for $f(x)=x$, x belongs to $(-1, 1)$ is
Option A:	-1
Option B:	1
Option C:	0
Option D:	2
10.	Fourier coefficient b_1 for $f(x) = x \cdot \sin x$, where $x \in (0, 2\pi)$ is
Option A:	0
Option B:	π
Option C:	$-\pi$
Option D:	$\frac{\pi}{\sqrt{2}} - \frac{\pi}{\sqrt{3}}$
11.	Fourier coefficient a_0 in half range cosine series for $f(x) = e^x$, $x \in (0,1)$ is
Option A:	$e+1$
Option B:	$-e-1$
Option C:	$-e+1$
Option D:	$e-1$
12.	Value of constant real number m such that $f(z) = f(x + iy) = e^{3mx+2iy}$ is analytic function is
Option A:	$2/3$
Option B:	$-2/3$
Option C:	$3/2$
Option D:	$-3/2$

13.	For real variables x, y function $u(x, y) = 2xy$												
Option A:	does not satisfy Laplacian equation.												
Option B:	is not continuous.												
Option C:	is harmonic.												
Option D:	is continuous but not partially differentiable.												
14.	For $f(z) = \sin x \cosh(y) + i \cos x \sinh(y)$, where $z = x + iy$, $f'(z)$ is												
Option A:	$-\sin z$												
Option B:	$\sinh z$												
Option C:	$\cos z$												
Option D:	$\cosh z$												
15.	If coefficients of correlation between variables x, y is 0.5 and coefficient of regression b_{xy} is 0.2 then coefficient of correlation b_{yx} is												
Option A:	1.25												
Option B:	-1.25												
Option C:	2.5												
Option D:	-2.5												
16.	<p>If a straight line is $y=ax+b$ is fitted to following data</p> <table border="1" style="margin-left: 20px;"> <tbody> <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>2</td> <td>3</td> <td>4</td> <td>5</td> </tr> </tbody> </table> <p>Then values of a & b are</p>	x	0	1	2	3	4	y	1	2	3	4	5
x	0	1	2	3	4								
y	1	2	3	4	5								
Option A:	$a=1, b=0$												
Option B:	$a=1, b=1$												
Option C:	$a=0, b=1$												
Option D:	$a=-1, b=1$												
17.	The coefficient of rank correlation between two variables with unequal ranks is -0.9 . If the number of pairs is 5, then the sum of squares of differences in ranks is												
Option A:	37												
Option B:	36												
Option C:	39												
Option D:	38												

18.	<p>If random variable X has the probability distribution as</p> <table border="1"> <tr> <td>X</td> <td>-2</td> <td>-1</td> <td>0</td> <td>1</td> <td>2</td> </tr> <tr> <td>P(X=x)</td> <td>3k</td> <td>2k</td> <td>2k</td> <td>k</td> <td>0.2</td> </tr> </table> <p>Then $P(-2 < X \leq 2)$ is</p>	X	-2	-1	0	1	2	P(X=x)	3k	2k	2k	k	0.2
X	-2	-1	0	1	2								
P(X=x)	3k	2k	2k	k	0.2								
Option A:	1												
Option B:	0.7												
Option C:	0.8												
Option D:	0.5												
19.	<p>A random variable X has probability distribution with $E(X) = 1.5$, $E(X^2) = 3$ then then variance is</p>												
Option A:	0.75												
Option B:	1.5												
Option C:	3												
Option D:	5.25												
20.	<p>A continuous random variable X has the probability law $f(x) = k^2 x^3$, $0 \leq x \leq 3$, $k > 0$ then value of k is</p>												
Option A:	2/81												
Option B:	4/81												
Option C:	4/9												
Option D:	2/9												

Q2 (20 Marks)	Solve any Four out of Six	5 marks each												
A	Find Laplace transform of $f(t) = \sin^2 t \cos^3 t$.													
B	Using convolution theorem find the inverse Laplace transform of $\phi(s) = \frac{s}{s^4 - 1}$													
C	Find Fourier series of $f(x) = x \sin x$ in $(-\pi, \pi)$.													
D	Find an analytic function $\omega = f(z) = u + iv$, where $z = x + iy$, whose real part is $u(x, y) = x^2 - y^2 + 2y - \sin(x) \cdot \sinh(y)$													
E	<p>Calculate Spearman's coefficient of rank correlation and Pearson's coefficient of correlation from the following data on height and weights of 5 students.</p> <table border="1"> <tr> <td>Height(in inches)</td> <td>61</td> <td>63</td> <td>65</td> <td>67</td> <td>69</td> </tr> <tr> <td>Weight(In kgs)</td> <td>64</td> <td>62</td> <td>65</td> <td>70</td> <td>72</td> </tr> </table>		Height(in inches)	61	63	65	67	69	Weight(In kgs)	64	62	65	70	72
Height(in inches)	61	63	65	67	69									
Weight(In kgs)	64	62	65	70	72									

F	<p>The warranty of electronic device in thousand of days has the density function $f(x) = \begin{cases} 4e^{-4x}, & x > 0 \\ 0, & \text{otherwise} \end{cases}$</p> <p>Find the expected warranty of the device.</p>
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Q3 (20 Marks)	Solve any Four out of Six	5 marks each																
A	<p>Given $f(t) = \begin{cases} 4, & 0 \leq x < 3 \\ 0, & x > 3 \end{cases}$.</p> <p>Find $L[f(t)]$, $L[f'(t)]$.</p>																	
B	Find inverse Laplace transform of $\phi(s) = \frac{3s^2+11s+11}{s^3+6s^2+11s+6}$																	
C	Find half range sine series for $f(x) = e^{-x}, 0 < x < 1$.																	
D	In the polar coordinates, let $\omega = u + iv$, $u(r, \theta) = r^2 \sin 2\theta$. Show that u satisfies Laplace's equation and find $v(r, \theta)$.																	
E	<p>Fit a second degree parabolic curve to the following data.</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td>x</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> </tr> <tr> <td>y</td> <td>1</td> <td>1</td> <td>3</td> <td>7</td> <td>13</td> <td>21</td> <td>31</td> </tr> </table>	x	0	1	2	3	4	5	6	y	1	1	3	7	13	21	31	
x	0	1	2	3	4	5	6											
y	1	1	3	7	13	21	31											
F	A random variable X has the probability distribution $P(X = x) = \frac{1}{16} ({}^4C_x)$, $x = 0,1,2,3,4$. Write Probability distribution and find standard deviation.																	

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Time: 2 hour

Max. Marks: 80

Question Number	Correct Option (Enter either 'A' or 'B' or 'C' or 'D')
Q1.	A
Q2.	C
Q3.	B
Q4	D
Q5	D
Q6	A
Q7	C
Q8.	B
Q9.	C
Q10.	B
Q11.	D
Q12.	A
Q13.	C
Q14.	C
Q15.	A
Q16.	B
Q17.	D
Q18.	B
Q19.	A
Q20.	D