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: **Information Technology**

Curriculum Scheme: Rev 2019

Examination: Second Year Semester III

Course Code: ITC301 and Course Name: Engineering Mathematics-3

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.	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 $f(t)=t^2e^{-t}$ 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 $\int_0^t \sin 2t \; cosh2t \; dt$ 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:	$e^{-2t}\,cost$
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 $f(x) = x.sinx$, 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 $f(z) = sinx\ cosh(y) + i\ cosx\ \sinh(y)$, 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.	If a straight line is y=ax+b is fitted to following data x: 0 1 2 3 4 y: 1 2 3 4 5 Then values of a & b are
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

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

<table>
<tr><td>Q2
(20 Marks)</td><td>Solve any Four out of Six 5 marks each</td></tr>
<tr><td>A</td><td>Find Laplace transform of $f(t) = sin^2t\ cos^3t.$</td></tr>
<tr><td>B</td><td>Using convolution theorem find the inverse Laplace transform of $$\emptyset(s) = \frac{s}{s^4 - 1}$$</td></tr>
<tr><td>C</td><td>Find Fourier series of $f(x) = x\ sinx$ in$(-\pi, \pi)$.</td></tr>
<tr><td>D</td><td>Find an analytic function $\omega = f(z) = u + iv, where\ z = x + iy$, whose real part is $u(x, y) = x^2 - y^2 + 2y - \sin(x)\,.\sinh(y)$</td></tr>
<tr><td>E</td><td>Calculate Spearman’s coefficient of rank correlation and Pearson’s coefficient of correlation from the following data on height and weights of 5 students.
<table>
<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></td></tr>
</table>

F	The warranty of electronic device in thousand of days has the density function $f(x) = \begin{cases} 4e^{-4x}, x > 0 \\ 0, \quad otherwise \end{cases}$ Find the expected warranty of the device.

Q3 (20 Marks)	**Solve any Four out of Six** **5 marks each**
A	Given $f(t) = \begin{cases} 4, & 0 \le x < 3 \\ 0, & x > 3 \end{cases}$. Find $L[f(t)]$, $L[f'(t)]$.
B	Find inverse Laplace transform of $\emptyset(s) = \frac{3s^2+11s+11}{s^3+6s^2+11s+6}$
C	Find half range sine series for $f(x) = e^{-x}$, $0 < x < 1$.
D	In the polar coordinates, let $\omega = u + iv$, $u(r,\theta) = r^2 sin2\theta$. Show that u satisfies Laplace's equation and find $v(r,\theta)$.
E	Fit a second degree parabolic curve to the following data. 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 $P(X = x) = \frac{1}{16}(4_{C_x})$, $x = 0,1,2,3,4$.Write Probability distribution and find standard deviation.

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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