

**University of Mumbai**  
**Examination 2021 under cluster \_\_ (Lead College: \_\_)**

Examinations Commencing from 10<sup>th</sup> April to 17<sup>th</sup> April 2021

Program: Information Technology

Curriculum Scheme: Rev 2019

Examination: SE Semester III

Course Code: ITC301 and Course Name: Engineering Mathematics III

Time: 2 hour

Max. Marks: 80

<b>Q1.</b>	<b>Choose the correct option for following questions. All the Questions are compulsory and carry equal marks</b>
1.	Laplace Transform of $e^{2t} \cos 2t$ is
Option A:	$\frac{s-2}{s^2-2s+8}$
Option B:	$\frac{s+2}{s^2-2s+8}$
Option C:	$\frac{s-2}{s^2+2s+8}$
Option D:	$\frac{s-2}{s^2+2s+4}$
2.	If $f(x) = \frac{1}{2}(\pi - x)$ , $0 < x < 2\pi$ then $a_0$ is
Option A:	$\frac{2}{\pi}$
Option B:	0
Option C:	$\frac{\pi}{2}$
Option D:	$\frac{\sqrt{2}}{\pi}$
3.	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 C:	$u$ and $v$ both need not be harmonic.
Option D:	$u$ and $v$ both are harmonic.
4.	If $\text{Var}(X) = 4$ then $\text{Var}(3x+4)$ is
Option A:	12
Option B:	20
Option C:	26
Option D:	36
5.	If $f(x)$ is an even function in the interval $(-l, l)$ then the Fourier coefficients are

Option A:	$a_n = 0, b_n = 0.$
Option B:	$a_n = 0, a_0 = 0.$
Option C:	$b_n = 0$
Option D:	$a_0 = 0, b_n = 0$
6.	Find $L^{-1}\left(\frac{s+2}{s^2+4s+13}\right)$
Option A:	$e^{2t} \cos 3t$
Option B:	$e^{2t} \sin 3t$
Option C:	$e^{-2t} \cos 3t$
Option D:	$\cos 3t$
7.	Find an analytic function whose real part is $u = x^3 - 6x^2y^2 + y^3$
Option A:	$f(z) = z^3 + c$
Option B:	$3z^3 + c$
Option C:	$-z^3 + c$
Option D:	$3z^2 + c$
8.	Find $L^{-1}\left(\frac{1}{3s-7}\right)$
Option A:	$\frac{1}{3}(e^{(7/3)t})$
Option B:	$\frac{-1}{3}(e^{(5/3)t})$
Option C:	$\frac{1}{3}(e^{(-7/3)t})$
Option D:	$\frac{1}{3}(e^{(5/3)t})$
9.	A variate x has the following probability distribution x : -3    6    9 P(x) : 1/6   1/2   1/3 Find E(X) .
Option A:	1/2
Option B:	11/2
Option C:	3/2
Option D:	13/2
10.	If $b_{yx} = 0.7764, b_{xy} = 1.2321$ then coefficient of correlation
Option A:	0.9781
Option B:	0.6291
Option C:	1.2307
Option D:	0.0023
11.	Find the Laplace Transform of $\frac{\cos 2t - \cos 3t}{t}$

Option A:	$\frac{1}{2} \log\left(\frac{s^2+9}{s^2+4}\right)$
Option B:	$\frac{1}{2} \log\left(\frac{s^2+4}{s^2+9}\right)$
Option C:	$\frac{1}{2} \log\left(\frac{s^2-4}{s^2-9}\right)$
Option D:	$\frac{1}{2} \log\left(\frac{s^2-4}{s^2+9}\right)$
12.	If two variables oppose each other then the correlation will be
Option A:	Positive correlation
Option B:	Zero correlation
Option C:	Perfect correlation
Option D:	Negative correlation
13.	Parseval's identity for the function $f(x)$ in the interval $(c, c + 2l)$
Option A:	$\int_c^{c+2l} [f(x)]^2 dx = a_0^2 + \frac{1}{2} \sum_{n=1}^{\infty} (a_n^2 + b_n^2).$
Option B:	$\frac{1}{2l} \int_c^{c+2\pi} [f(x)]^2 dx = a_0^2 + \frac{1}{2} \sum_{n=1}^{\infty} (a_n^2 + b_n^2).$
Option C:	$\frac{1}{2l} \int_c^{c+2l} [f(x)]^2 dx = a_0^2 + \frac{1}{2} \sum_{n=1}^{\infty} (a_n^2 + b_n^2).$
Option D:	$\frac{1}{2\pi} \int_c^{c+2\pi} [f(x)]^2 dx = a_0^2 + \frac{1}{2} \sum_{n=1}^{\infty} (a_n^2 + b_n^2).$
14.	The limits for coefficient of correlation are
Option A:	$-1 \leq r \leq 2.$
Option B:	$-1 \leq r \leq 0.$
Option C:	$-1 \leq r \leq 1.$
Option D:	$0 \leq r \leq 1.$
15.	The value of $\int_0^{\infty} e^{-2t}(1 - t^2)dt$ is
Option A:	$\frac{1}{4}$
Option B:	0
Option C:	$\frac{2}{3}$
Option D:	$\frac{1}{2}$
16.	A continuous random variable $X$ has the following probability mass function $f(x) = kx^2, 0 \leq x \leq 2$ , then the value of $k$ is
Option A:	8/3
Option B:	3/8

Option C:	1
Option D:	5/3
17.	If $\frac{\pi^2}{3} + 4 \sum_{n=1}^{\infty} (-1)^n \frac{\cos nx}{n^2}$ then $a_n$ and $b_n$ are
Option A:	$a_n = 4 \sum_{n=1}^{\infty} (-1)^n \frac{\cos nx}{n^2}$ , $b_n = 0$
Option B:	$a_n = 0$ , $b_n = 4 \sum_{n=1}^{\infty} (-1)^n \frac{\cos nx}{n^2}$
Option C:	$a_n = 0$ , $b_n = \frac{\pi^2}{3}$
Option D:	$a_n = \frac{\pi^2}{3}$ , $b_n = 4 \sum_{n=1}^{\infty} (-1)^n \frac{\cos nx}{n^2}$
18.	Find $L^{-1}\left[\log\left(\frac{s+1}{s+3}\right)\right]$ .
Option A:	$\frac{-1}{t}(e^{-t} - e^{-3t})$ .
Option B:	$\frac{-1}{2t}(e^{-t} - e^{-3t})$ .
Option C:	$\frac{-1}{t}(e^t - e^{-3t})$ .
Option D:	$\frac{1}{t}(e^{-t} - e^{-5t})$ .
19.	Find $L^{-1}\left[\frac{1}{s(s^2+4)}\right]$
Option A:	$\frac{1}{4}(1 - \cos 2t)$
Option B:	$(1 + \cos 2t)$
Option C:	$\frac{1}{4}(1 - \sin 2t)$
Option D:	$\frac{1}{4}(1 + \cos t)$
20.	Find the constant 'a' if $f(z) = ax^2y - y^3 + i(3xy^2 - x^3)$ is analytic
Option A:	$a = 0$
Option B:	$a = 3$
Option C:	$a = 6$
Option D:	$a = 2$

<b>Q2.</b> <b>(20 Marks)</b>	<b>Solve any Four out of Six 5 marks each</b>
A	Fit a straight line to the following data $(X, Y) = (1, -5), (1, 1), (2, 4), (3, 7), (4, 10)$
B	

	Find half range cosine series for $f(x) = x(\pi - x)$ , $0 < x < \pi$
C	Find $L^{-1}\left[\frac{1}{(s+3)(s-4)^2}\right]$ using convolution theorem.
D	Find the orthogonal trajectories of the family of curves $3x^2y + 2x^2 - y^3 - 2y^2 = c$
E	A discrete random variable has p.d.f. given below X :     -2   -1   0     1     2     3 P(X=x) : 0.2   k   0.1   2k   0.1   2k  Find k and $(P(X \geq 1))$
F	Evaluate $\int_0^{\infty} \frac{e^{-t} - e^{-3t}}{t} dt$

<b>Q3 . (20 Marks)</b>	<b>Solve any Four out of Six 5 marks each</b>
A	Show that $u = 3x^2y - y^3$ is harmonic. Find the corresponding analytic function.
B	Find $L^{-1}\left[\frac{5s+3}{(s-1)(s^2+2s+5)}\right]$
C	Find the Fourier series for $f(x) = x^3$ , in $(-\pi, \pi)$
D	Find the expectation and M.G.F. of the following distribution X :           -2     3     1 P(X=x) :    1/3    1/2    1/6
E	Compute Spearman's rank correlation coefficient from the following data X : 16, 18, 25, 30, 12 Y : 38, 21, 38, 16, 50
F	Find Laplace transform of $te^{-t} \cos \cos t$

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