University of Mumbai

Examinations Commencing from 10th April 2021 to 17th April 2021

Program: **BE Electronics and Telecommunication Engineering**

Curriculum Scheme: Rev 2019 'C' Scheme

Examination: SE Semester III

Course Code: **ECC301** and Course Name: **Engineering Mathematics III**

Time: 2 hour Max. Marks: 80

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Note: All Questions are compulsory.

Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks. 2 marks each**
1.	Laplace Transform of $\{t\ sin3t\}$ is
Option A:	$-\frac{6s}{(s^2+9)^2}$
Option B:	$-\frac{3}{(s^2+9)^2}$
Option C:	$\frac{6s}{(s^2+9)^2}$
Option D:	$-\frac{6}{(s^2+9)^2}$
2.	Laplace Transform of $\{sin2t\ sin3t\}$ is
Option A:	$\frac{1}{2}\left[\frac{s}{s^2+1}-\frac{s}{s^2+25}\right]$
Option B:	$\frac{1}{2}\left[\frac{s}{s^2+1}+\frac{s}{s^2+25}\right]$
Option C:	$\frac{1}{2}\left[\frac{s}{s^2+25}-\frac{s}{s^2+1}\right]$
Option D:	$\left[\frac{s}{s^2+1}-\frac{s}{s^2+25}\right]$
3.	Laplace Transform of $\{e^{2t}(1+sint)\}$ is
Option A:	$\frac{1}{(s+2)}+\frac{1}{(s+2)^2+1}$
Option B:	$\frac{1}{(s-2)}+\frac{s}{(s-2)^2+1}$
Option C:	$\frac{1}{(s-2)}+\frac{1}{(s-2)^2+1}$
Option D:	$\frac{1}{(s-2)}+\frac{1}{(s-2)^2-1}$

4.	If $L\{f(t)\} = \frac{1}{s\sqrt{s+1}}$, then $L\{f(2t)\}$ is
Option A:	$\frac{1}{2s}\sqrt{\frac{2}{(s+2)}}$
Option B:	$\frac{1}{s}\sqrt{\frac{2}{(s+2)}}$
Option C:	$\frac{1}{2}\sqrt{\frac{s}{(s+2)}}$
Option D:	$\sqrt{\frac{2}{(s+2)}}$
5.	Inverse Laplace Transform of $\frac{1}{s^4}$ is
Option A:	$\frac{1}{3!}t^4$
Option B:	$\frac{1}{2!}t^4$
Option C:	$\frac{1}{3!}t^3$
Option D:	$\frac{1}{4!}t^4$
6.	Inverse Laplace Transform of $\frac{1}{s} + \frac{1}{(s+2)^2}$ is
Option A:	$1 - te^{-2t}$
Option B:	$1 + te^{2t}$
Option C:	$1 + e^{-2t}$
Option D:	$1 + te^{-2t}$
7.	Inverse Laplace Transform of $\frac{1}{(s-2)^2-1}$ is
Option A:	$e^{-2t}sinht$
Option B:	$e^{2t}sint$
Option C:	$e^{2t}sinht$
Option D:	$e^{2t}cosht$
8.	Find Fourier coefficient a_0 for the function $f(x) = 2x - 3x^2$, $0 \leq x \leq 2\pi$?
Option A:	$1 - 2\pi$
Option B:	$\pi(1 - 2\pi)$

Option C:	0
Option D:	$2\pi(1 - 2\pi)$
9.	Find Fourier coefficient b_1 in half range sine series for the function $f(x) = sinx,\ 0 < x < \pi$?
Option A:	$\frac{\pi}{2}$
Option B:	0
Option C:	1
Option D:	-1
10.	Find Fourier coefficient a_0 for the function $f(x) = 1 - x^2, -1 \leq x \leq 1$
Option A:	$\frac{2}{3}$
Option B:	$\frac{1}{3}$
Option C:	0
Option D:	$-\frac{2}{3}$
11.	Which of the following is related to Cauchy-Riemann equations?
Option A:	$u_x = v_y, u_y = v_x$
Option B:	$u_x = -v_y, u_y = v_x$
Option C:	$u_x = v_y, u_y = -v_x$
Option D:	$u_x = u_y, v_y = v_x$
12.	If the eigenvalues of a 4x4 matrix A are given as 2 ,-3,-13 and 7,then determinant of A is
Option A:	19
Option B:	45
Option C:	546
Option D:	25
13.	What is the divergence of the vector field $\vec{f} = 3x^2\hat{\imath} + 5xy^2\hat{\jmath} + xyz^3\hat{k}$ at the point (1, 2, 3)?
Option A:	89
Option B:	80
Option C:	124
Option D:	100

14.	The Eigen values of the following matrix are $A = \begin{bmatrix} -2 & 5 & 4 \\ 0 & 7 & 5 \\ 0 & 0 & 2 \end{bmatrix}$
Option A:	-3 , 12, -6
Option B:	2,4 , 5
Option C:	1, 2 ,3
Option D:	-2,2,7
15.	If $u = 2x + kx^3 + 3xy^2$ is harmonic then the value of the constant k is
Option A:	3
Option B:	-1
Option C:	2
Option D:	0
16.	A vector field which has a vanishing divergence is called as
Option A:	Solenoidal field
Option B:	Rotational field
Option C:	Hemispheroidal field
Option D:	Irrotational field
17.	If all Eigen values are distinct then the matrix is
Option A:	Non-diagonalizable
Option B:	Diagonalizable
Option C:	Symmetric
Option D:	Singular
18.	If $f(z) = ze^z$ then it's real part u is given by
Option A:	$e^x\{x\,siny + y\,cosy\}$
Option B:	$e^x\{y\,siny + x\,cosy\}$
Option C:	$e^x\{x\,cosy - y\,siny\}$
Option D:	$e^x\{y\,siny - x\,cosy\}$
19.	If the Eigenvalues of a matrix A are 1,-2,-1 then the Eigenvalues of $A^2 - A - 2I$ are
Option A:	-4,4,0
Option B:	2,4,1
Option C:	2,4,0
Option D:	-2,4,0
20.	Determine the constants a, b, c if $\overline{F}$ is irrotational where $\overline{F} = (axy + bz^3)i + (3x^2 - cz)j$
Option A:	-6,0,1
Option B:	6,0,0
Option C:	0,6,0

Option D:	6,6,1

Q2. (20 Marks)	**Solve any Four out of Six.** **5 marks each**
A	Find $L\left[(t + sint)^2\right]$
B	$Find\ L^{-1}\left[\frac{4s+12}{s^2+8s+12}\right]$
C	Obtain the Fourier series for $f(x) = x$ in $(0, 2\pi)$.
D	Find the analytic function $f(z)\ in\ terms\ of\ z$ whose real part is $u = x^3 - 3xy^2 + 3x^2 - 3y^2 + 1$.
E	Find the Eigenvalues of matrix $A = [1\ 2\ 3\ 2\ -1\ 4\ 3\ 1\ -1]$ and Show that matrix satisfies the characteristic equation .
F	Show that $\overline{F} = \left(y^2 - z^2 + 3yz - 2x\right)i + (3xz + 2xy)j + (3xy - 2xz$ is both irrotational and solenoidal.

Q3. (20 Marks)	**Solve any Four out of Six.** **5 marks each**
A	Evaluate $\int_0^t \frac{\sin sin\, u}{u}\, du$
B	$Find\ L^{-1}\left[\frac{1}{s(s^2+9)}\right]$
C	Obtain half range Fourier sine series for $f(x) = x(\pi - x)$ in $(0, \pi)$.
D	Find the constants a, b, c, d, e if $f(z) = \left(ax^3 + bxy^2 + 3x^2 + cy^2 + x\right) + i(dx^2y - 2y^3 + ex$ is analytic.
E	Find Eigenvalues & Eigenvectors for the matrix $A = [3\ -4\ 2\ -3]$
F	Evaluate by using Green's theorem $\int_C \left(x^2 - y\right)dx + (2y^2 + x)dy$, where C is the closed region bounded by $y = 4$ and $y = x^2$.

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