University of Mumbai
Examination 2021

Program: Civil Engineering
Curriculum Scheme: Rev2019
Examination: First/**Second**/Third/Final Year SemesterI/II/**III**/IV/V/VI/VII/VIII
Course Code:CEC301 and Course Name: Applied Mathematics III
Time: 1 hour Max. Marks: 80

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For the students:- All the Questions are compulsory and carry equal marks .

Q1.	Find the Laplace transform of f(t), f(t)=a, 0< t <b and f(t)=0, t>b
Option A:	$\frac{ab}{s}(1-e^{-bt})$
Option B:	$\frac{b}{s}(1-e^{-bt})$
Option C:	$\frac{a}{s}(1-e^{-bt})$
Option D:	$\frac{-a}{s}(1-e^{-bt})$
Q2.	Find the Laplace transform of $4t^2+\sin 3t+e^{2t}$
Option A:	$\frac{9}{s^3}+\frac{3}{s^2+3^2}+\frac{1}{s-2}$
Option B:	$\frac{8}{s^3}+\frac{8}{s^2+3^2}+\frac{1}{s-2}$
Option C:	$\frac{8}{s^3}+\frac{3}{s^2+3^2}+\frac{4}{s-2}$
Option D:	$\frac{8}{s^3}+\frac{3}{s^2+3^2}+\frac{1}{s-2}$
Q3.	Construct an analytic function whose real part is $x^4-6x^2y^2+y^4$
Option A:	z^4+c
Option B:	ez^4+c
Option C:	e^4+c
Option D:	x^4+c
Q4.	Find the Inverse Laplace transform $\frac{1}{s(s+a)}$
Option A:	$\frac{1-e^{-at}}{ab}$
Option B:	$\frac{1-e^{-at}}{a}$
Option C:	$\frac{1-e^{-t}}{a}$
Option D:	$\frac{1-e^{at}}{a}$
Q5.	Find $L^{-1}[\frac{1}{S(S^2+4)}]$

Option A:	$\frac{1}{4}(1-cos2t)$
Option B:	$\frac{1}{45}(1-sin2t)$
Option C:	$\frac{1}{4}(1-Cot2t)$
Option D:	$\frac{1}{4}(1-tan2t)$
Q6.	Find the Eigenvalue for the given matrix. $A=\begin{bmatrix}4 & 1 & 3\\ 1 & 3 & 1\\ 2 & 0 & 5\end{bmatrix}$.
Option A:	13
Option B:	-3
Option C:	7.1
Option D:	8.3
Q7.	Find the Eigen vector for value of λ=-2 for the given matrix. $A=\begin{bmatrix}3 & 5\\ 3 & 1\end{bmatrix}$.
Option A:	$[0\ -1]$
Option B:	$[1\ -1]$
Option C:	$[-1\ -1]$
Option D:	$[1\ 0]$
Q8.	What is the value of k to solve $\frac{\partial^2 u}{\partial x^2}-32\frac{\partial u}{\partial t}=0$ by Bender Schmidt method with h = 0.25 if h & k are the increments of x and t respectively.
Option A:	0.25
Option B:	1
Option C:	0.5
Option D:	0.75
Q9.	If A is diagonalizable then, _____
Option A:	$A^n = (PDP^{-1})^n = PD^nP^n$
Option B:	$A^n = (PDP^{-1})^n = PD^nP^1$
Option C:	$A^n = (PDP^{-1})^n = PD^nP^{-1}$
Option D:	$A^n = (PDP^{-1})^n = PD^nP$
Q10.	Construct an analytic function whose imaginary part is $\frac{y}{x}$
Option A:	tan z +c
Option B:	sec z +c
Option C:	e^x z +c
Option D:	log z +c

Q11.	Find the value of an for xcosx in (- π , π)
Option A:	1/n
Option B:	0
Option C:	2/n
Option D:	4
Q12.	In Fourier integral an is zero when function is
Option A:	Even
Option B:	Odd
Option C:	Real
Option D:	Neither even nor odd
Q13.	If f(x) is odd function then Fourier integral f(x) reduced to
Option A:	Cosine
Option B:	Sine
Option C:	Cosine and sine
Option D:	0
Q14.	What are periodic signals?
Option A:	The signals which change with time
Option B:	The signals which change with frequency
Option C:	The signal that repeats itself in time
Option D:	The signals that repeat itself over a fixed frequency
Q15.	Find the Laplace transform of sin5t
Option A:	$\frac{5}{s^2+5^2}$
Option B:	$\frac{s}{s^2+5^2}$
Option C:	$\frac{5}{s^2-5^2}$
Option D:	$\frac{s}{s^2-5^2}$
Q16.	The determinant of the matrix whose eigen values are 4, 2, 3 is given by, _____
Option A:	9
Option B:	24
Option C:	5
Option D:	3
Q17.	The harmonic conjugate of e^x cosy is …….
Option A:	e^x cosy + c
Option B:	e^x siny + c
Option C:	e^x + c
Option D:	e^{-x} + c
Q18.	A function Φ(x, y) satisfying Laplace equation is called

Option A:	Analytic
Option B:	Holomorphic
Option C:	Harmonic
Option D:	Non-hormonic
Q19.	The partial differential equation $xy\frac{\partial z}{\partial x} = \frac{\partial^2 z}{\partial y^2}$
Option A:	Elliptic
Option B:	Hyperbolic
Option C:	Parabolic
Option D:	Not defined
Q20.	The partial differential equation$5\frac{\partial^2 z}{\partial y^2} + 6\ \frac{\partial^2 z}{\partial y^2} = xy$
Option A:	Elliptic
Option B:	Hyperbolic
Option C:	Parabolic
Option D:	Not defined

Q2 (20 Marks)	**Solve any Four out of Six 5 marks each**
A	Find the Laplace transform of $\frac{1}{t}e^{-t}sint$
B	Find the inverse Laplace transform of $\frac{1}{\sqrt{2s+1}}$
C	Show that the function, $f(z) = sinhz$ is analytic and find $f'(z)$ in terms of z.
D	Find the Fourier series for f (x)= x in (0,2π).
E	Using Bender- Schmidt method, solve $\frac{\partial^2 u}{\partial x^2} - \frac{\partial u}{\partial t} = 0$, -subject to the conditions, u(0,t) = 0 , u(4,t) = 0, $u(x,0) = x^2(16 - x^2)$ taking h =1, for 3 minutes
F	Find Eigen value and Eigen vector of matrix $[4\ 6\ 6\ 1\ 3\ 2\ -1\ -5\ -2\ ]$

Q3 (20 Marks)	**Solve any Four out of Six 5 marks each**
A	Find the Laplace transform of $cost\ cos2t\ cos3t$
B	Find the inverse Laplace transform of $\frac{s+2}{s^2(s+3)}$
C	Determine whether the function $f(z) = x^2 - y^2 + 2ixy$ is analytic and if so Find its derivative.
D	Find the Fourier series for $f(x) = e^{-\|x\|}$ in (-π,π).
E	Find Eigen value and Eigen vector of matrix$[2\ -1\ 1\ 1\ 2\ -1\ 1\ -1\ 2\ ]$
F	Solve by Crank Nicholson simplified formula $\frac{\partial^2 u}{\partial x^2} - 16\frac{\partial u}{\partial t} = 0$, u(0,t) = 0, u(1,t) – 200t, u(x,0) = 0 taking h = 0.25 for one time step.