University of Mumbai
Examination 2020

Examinations Commencing from 7th January 2021 to 20th January 2021

Program: EXTC AND ETRX

Curriculum Scheme: Rev2019

Examination: FE/SE/TE/BE Semester III

Course Code: ECC301 and Course Name: ENGINEERING MATHEMATICS

Time:2 hour Max. Marks: 80

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

Q1.	L[Sinat]
Option A:	$\frac{a}{s^2+a^2}$
Option B:	$\frac{a}{s^2-a^2}$
Option C:	$\frac{s}{s^2-a^2}$
Option D:	$\frac{s}{s^2+a^2}$
Q2.	Laplace Transform of $e^{2t}[\cos 3t + \frac{4}{3}\sin 3t]$
Option A:	$\frac{s+2}{s^2-4s+13}$
Option B:	$\frac{s+3}{s^2-4s+13}$
Option C:	$\frac{s+4}{s^2-4s+13}$
Option D:	$\frac{s-2}{s^2-4s+13}$
Q3.	Laplace Transform of e^{2t} $[t^4 \div 24 + \frac{t^5}{60}]$
Option A:	$\frac{s}{(s-2)^6}$
Option B:	$\frac{s+2}{s^2-4s+7}$
Option C:	$\frac{s+2}{s^2-4s+1}$
Option D:	$\frac{s+2}{s^2-4s-13}$
Q4.	Laplace Transform of $[-1 - t - \frac{t^2}{2} + e^t]$
Option A:	$\frac{1}{s^3(s+1)}$
Option B:	$\frac{1}{s^3(s-4)}$

Option C:	$\frac{1}{s}$
Option D:	$\frac{1}{s^3\,(s-1)}$
Q5.	Inverse Laplace Transform of $\frac{s^2}{(s^2+a^2)(s^2+b^2)}$
Option A:	$\frac{1}{(a^2-b^2)}$[asinat +bsinbt]
Option B:	$\frac{1}{(a^2-b^2)}$[asinat –bsinbt]
Option C:	$\frac{1}{(a^2-b^2)}$[asinat –bcosbt]
Option D:	$\frac{1}{(a^2-b^2)}$[acosat –bsinbt]
Q6.	Inverse Laplace Transform of $\frac{s+4}{s(s-1)(s^2+4)}$
Option A:	-1 +e^t -$\frac{1}{2}\sin 2t$
Option B:	-1 -e^t -$\frac{1}{2}\sin 2t$
Option C:	-1 +e^t +-$\frac{1}{2}\sin 2t$
Option D:	1 +e^t -$\frac{1}{2}\sin 2t$
Q7.	Inverse Laplace Transform of $\frac{2s}{s^4+4}$
Option A:	$\sin t \sinh t$
Option B:	$\csc t \sec t$
Option C:	$\cos t \cosh t$
Option D:	$\cot t \tan ht$
Q8.	Inverse Laplace Transform of $\frac{1}{(s+4)^2(s-3)}$
Option A:	$e^{3t}[\frac{1}{49} - \frac{1}{49}e^{-7t} - \frac{t}{7}e^{-7t}]$
Option B:	$e^{3t}[\frac{1}{49} + \frac{1}{49}e^{-7t} - \frac{t}{7}e^{-7t}]$
Option C:	$e^{3t}[\frac{1}{49} + \frac{1}{49}e^{-7t} + \frac{t}{7}e^{-7t}]$
Option D:	$e^{3t}[\frac{1}{49} - \frac{1}{49}e^{-7t} - \frac{2}{7}e^{-7t}]$
Q9.	Find a ,b ,c .d if f(z) =[x^2 +2axy +by^2] + i[cx^2+2dxy + y^2] is analytic function
Option A:	a = 1 b = -1 c = -1 d = - 1
Option B:	a = 1 b = 1 c = -1 d = 1
Option C:	a = 1 b = -1 c = -1 d = 1
Option D:	a = -1 b = -1 c = -1 d = 1
Q10.	Find Real Part of Analytic function whose Imaginary part v = x^2+$\frac{x}{x^2+y^2}$ -y^2

Option A:	2xy - $\frac{y}{x^2+y^2}$
Option B:	-2xy + $\frac{y}{x^2+y^2}$
Option C:	2xy + $\frac{y}{x^2+y^2}$
Option D:	-xy + $\frac{y}{x^2+y^2}$
Q11.	If v = $e^x \sin y$ then its Harmonic Conjugate is
Option A:	$e^x \sin y$
Option B:	$-e^x \sin y$
Option C:	$e^x \cos y$
Option D:	$e^x \sin x$
Q12.	$\nabla \frac{1}{r}$
Option A:	$-\frac{\overrightarrow{r}}{r^3}$
Option B:	$\frac{\overrightarrow{}}{-r3}$
Option C:	$-\frac{\overrightarrow{r}}{r}$
Option D:	$\frac{\overrightarrow{r}}{r^3}$
Q13.	∇r^3
Option A:	n$r^{n-2}\underset{r}{\rightarrow}$
Option B:	$-nr^{n-2}\underset{r}{\rightarrow}$
Option C:	$-r^{n-2}\underset{r}{\rightarrow}$
Option D:	$r^{n-8}\underset{r}{\rightarrow}$
Q14.	Find a ,b ,c if $\underset{f}{\rightarrow}$ = [axy +bz^3]i^ +[3x^2-cz]j^ + [3xz^2 -y]k^ is irrotiational.
Option A:	a =6 , b =1, c = 1
Option B:	a =4 , b =1, c = 1
Option C:	a =6 , b =3, c = 1
Option D:	a =6 , b =1, c = 2
Q15.	if $\underset{F}{\rightarrow}$ = (x^2 –yz)i^ + (y^2-zx)j^ +(z^2 -xy)k^ is
Option A:	Solenoidal
Option B:	Irrotational
Option C:	Both a and b
Option D:	Neither a nor b
Q16.	In fourier series of x^2 in [-π π] a_0 is
Option A:	$-\frac{\pi^2}{3}$

Option B:	$\frac{\pi^2}{9}$
Option C:	$\frac{\pi^2}{3}$
Option D:	$\frac{\pi^2}{4}$
Q17.	In Fourier series of x^2 [0, 3] what is b_1
Option A:	$12[\frac{\pi^2-4}{\pi^3}]$
Option B:	$18[\frac{\pi^2-4}{\pi^3}]$
Option C:	$14[\frac{\pi^2-4}{\pi^3}]$
Option D:	$17[\frac{\pi^2-4}{\pi^3}]$
Q18.	In fourier series of f(x) = x what is a_0 =
Option A:	1
Option B:	2
Option C:	3
Option D:	6
Q19.	Eigen values of $\begin{bmatrix} 3 & 1 & 1 \\ 2 & 4 & 2 \\ 1 & 1 & 3 \end{bmatrix}$ are
Option A:	6,2,2
Option B:	1,2,3
Option C:	4,3,2
Option D:	0, 2, 7
Q20.	The Eigen values of $\begin{bmatrix} -1 & 4 \\ 2 & 1 \end{bmatrix}$
Option A:	3, -3
Option B:	2,1
Option C:	-1, -1
Option D:	3, 3

Q2. **(20 Marks)**	**Solve any Four out of Six 5 marks each**
A	Find e^A and $4^A$where A = $\frac{1}{2}\begin{bmatrix}3 & 1\\ 1 & 3\end{bmatrix}$
B	Find Eigen values and vector of $\begin{bmatrix}2 & 2 & 1\\ 1 & 3 & 1\\ 1 & 2 & 2\end{bmatrix}$
C	Find half range sine series for f(x) =x^2 in [0,3]
D	Obtain Fourier series of f(x) = 0 $-\pi \le x \le 0$ x^2 $0 \le x \le \pi$
E	show that $\underset{F}{\rightarrow}$ = (x^2 –yz)i^ + (y^2-zx)j^ +(z^2 -xy)k^ is conservative field . find its scalar potential.
F	Evaluate by Greens theorem $\oint(x^2y\,dx + y^3)dy$ where c is the closed path formed by y =x and y = x^2

Q3. **(20 Marks)**	**Solve any Four out of Six 5 marks each**
A	Show that v = $e^x[x\sin y + y\cos y]$ satisfied Laplace equation and find its corresponding analytic function.
B	If f(z) = u +iv is analytic function and u-v =$e^x(\cos y - \sin y)$ find f(z)
C	Find inverse Laplace of the following$\frac{s}{(2s+1)^2}$
D	If $\int_0^\infty e^{-2t}\ \sin(t+\alpha)\cos(t-\alpha)\ = \frac{3}{8}$ then find α
E	Find Laplace transform of $\frac{\sin t \cos 2t}{e^t}$
F	Find inverse Laplace of the following $\frac{1}{(s^4\ -s^3)}$