University of Mumbai

Examination 2020 under cluster ___ (Lead College Shortname)

Program: Mechanical/CIVIL Engineering

Curriculum Scheme: Rev 2012

Examination: Second Year Semester III

Course Code: MEC / CEC 301 and Course Name: Applied Mathematics III

Time: 1 hour Max. Marks: 50

==========

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

Q1.	$L(e^{2t}cos\omega t) =$ _____
Option A:	$\frac{s}{s^2+\omega^2}$
Option B:	$\frac{(s-2)}{(S-2)^2+\omega^2}$
Option C:	$\frac{(s+2)}{(S+2)^2+\omega^2}$
Option D:	$\frac{2}{(S+\omega)^2+2^2}$
Q2.	What is the fixed point of $w=\frac{5-4z}{4z-3}$
Option A:	$\frac{5}{4},-1$
Option B:	$\frac{-5}{4},1$
Option C:	$-5,4$
Option D:	$5,-4$
Q3.	Evaluate $\int_c z^3 dz$ where C is a unit circle from $\theta=0$ to $\theta=\pi$.
Option A:	0
Option B:	0.5
Option C:	2
Option D:	$\frac{1}{2}$
Q4.	Fourier coefficient a_0 $of\ f(x)=2x-1\ in\ (0,3)$
Option A:	3
Option B:	$\frac{1}{2}$
Option C:	1
Option D:	2
Q5.	Find values of p, q if following is solution of

	$\frac{\partial^2 u}{\partial x^2} - 200\frac{\partial u}{\partial t} = 0,\ given\ u(0,t) = 0,\ u(0.5,t) = 0, h = 0.1, k = 1.$ using Bender-Schmidt method. <table><tr><td>x / t</td><td>0</td><td>0.1</td><td>0.2</td><td>0.3</td><td>0.4</td><td>0.5</td></tr><tr><td>1</td><td>a</td><td>0.09</td><td>0.16</td><td>0.21</td><td>0.24</td><td>c</td></tr><tr><td>2</td><td>b</td><td>p</td><td>0.15</td><td>0.20</td><td>q</td><td>d</td></tr></table>
Option A:	$p = 0.08,\ q = 0.15$
Option B:	$p = 0.15,\ q = 0.23$
Option C:	$p = 0.23,\ q = 0.15$
Option D:	$p = 0.08,\ q = 0.105$
Q6.	Find constants a, b if $f(z) = \left(3x^2y + 2x^2 + ay^3 - 2y^2\right) + i\left(bxy - x^3 + 3xy^2\right)$ is analytic.
Option A:	$a = 1, b = 4$
Option B:	$a = 4, b = 1$
Option C:	$a = -1, b = 4$
Option D:	$a = -1, b = -4$
Q7.	The function $f_3(x) = ax^2 - \frac{1}{2}$ is orthogonal to functions $f_1(x) = 1$ and $f_2(x) = x$ in the interval (-1, 1). The value of a will be
Option A:	3
Option B:	$\frac{3}{2}$
Option C:	0
Option D:	None of these.
Q8.	Find the analytic function whose real part is $x^2 - y^2 + 3y - 2x + 3$.
Option A:	$f(z) = z^2 - 2z + 3zi$
Option B:	$f(z) = z^2 - 2z - 3zi$
Option C:	$f(z) = z^2 + 3z - 2zi$
Option D:	$f(z) = z^2 - 3z - 3zi + 4$
Q9.	$L(\int_0^t \int_0^t \int_0^t \sin u\ du^3) =$_____
Option A:	$\frac{1}{s^3(s^2+1)}$

Option B:	$\frac{s^2}{(s^2+1)}$
Option C:	$\frac{s}{(S+1)^2}$
Option D:	$\frac{1}{s^2(s^2+1)}$
Q10.	Find value of b_n in the Fourier expansion of function $f(x)=(2-x^2)$ in the interval $(0,2)$.
Option A:	$\frac{2}{n\pi}+\frac{2}{n^3\pi^3}$
Option B:	$\frac{2}{n\pi}$
Option C:	$\frac{4}{n\pi}$
Option D:	$\frac{4}{n^3\pi^3}$
Q11.	Find the value of $L^{-1}[\log(s^2-7s+10)]$.
Option A:	$-\frac{1}{t}(e^{5t}-e^{-2t})$
Option B:	$\frac{1}{t}(e^{5t}+e^{2t})$
Option C:	$-\frac{1}{t}(e^{2t}-e^{5t})$
Option D:	$-\frac{1}{t}(e^{5t}+e^{2t})$
Q12.	Evaluate $\int_c \frac{2z-6}{(z-2)(z-5)}dz$ where c is the circle $\lvert z\rvert=\frac{1}{2}$
Option A:	0
Option B:	$2\pi i$
Option C:	$-2\pi i$
Option D:	$-4\pi i$
Q13.	Evaluate $L^{-1}\left[\frac{1}{(S-2)^4}\right]$.
Option A:	$e^{2t}\frac{t^3}{3!}$
Option B:	$e^{2t}\frac{t^5}{\lceil 5}$
Option C:	$e^{-2t}\frac{t^4}{4!}$

Option D:	$e^{-2t}\frac{t^5}{5!}$
Q14.	Find poles of function $\frac{1}{z\cos z}$.
Option A:	0
Option B:	$n\pi$ for $n=0,\ \pm1,\ \pm2,....$
Option C:	$\frac{n\pi}{2}$ for $n=0,\ \pm1,\ \pm2,....$
Option D:	$0,\frac{(2n+1)\pi}{2}$ for $n=0,\ \pm1,\ \pm2,....$
Q15.	Find values of unknown 'j' if following is solution of $\frac{\partial^2 u}{\partial x^2}-\frac{\partial u}{\partial t}=0,\ given\ u(x,0)=0,\ u(0,t)=0, h=1/4.$ using Crank- Nicholson simplified formula.

t \ x	0	0.25	0.5	0.75	1
a	b	c	d	e	f
g	h	i	j	k	1/16

Option A:	0.0011
Option B:	0.00446
Option C:	0.0132
Option D:	0.0167
Q16.	If $f(z)=r^3 cosk\theta + ir^k sink\theta$ is analytic then k=_____.
Option A:	-4
Option B:	4
Option C:	-3
Option D:	3
Q17.	Evaluate $L^{-1}\left[\frac{1}{s(s-3)}\right]$.
Option A:	$\frac{1}{3}+\frac{1}{3}e^{3t}$
Option B:	$\frac{-1}{3}e^{3t}+\frac{1}{3}e^{3t}$
Option C:	$\frac{1}{3}(e^{3t}-1)$
Option D:	$\frac{1}{3}(1-e^{3t})$
Q18.	$f(x)=\lvert x\rvert$ in $(-\pi,\pi)$ then Fourier Coefficient a_n=____

Option A:	$\frac{[(-1)^n - 1]}{n^2\pi}$
Option B:	$\frac{2[(-1)^n - 1]}{n^2\pi}$
Option C:	0
Option D:	$\frac{2[(-1)^n + 1]}{n^2\pi}$
Q19.	Which of the following method is used to solve Laplace equation?
Option A:	Bender- Schmidt method
Option B:	Milne-Thompson method
Option C:	Crank- Nicholson Simplified formula
Option D:	Relaxation method
Q20.	In half range cosine series of $f(x) = x\ in\ (0,2)$ value of b_n is
Option A:	1
Option B:	$\frac{4[(-1)^n - 1]}{n^2\pi^2}$
Option C:	$\frac{4[(-1)^n + 1]}{n^2\pi^2}$
Option D:	0
Q21.	Using applications of residue theorem, $\int_0^{2\pi} \frac{d\theta}{2+5\sin\theta} =$ _____
Option A:	$\int_c \frac{2dz}{2z^2+4iz+5}$ where c is $\|z\|=1$
Option B:	$\int_c \frac{2dz}{5z^2+4iz-5}$ where c is $\|z\|=1$
Option C:	$\int_c \frac{2dz}{3z^2+10iz-3}$ where c is $\|z\|=1$
Option D:	$\int_c \frac{dz}{2z^2+10iz-2}$ where c is $\|z\|=1$
Q22.	$\int_0^\infty e^{-t}\, erf 3\sqrt{t} dt =$ _____
Option A:	$\frac{3}{\sqrt{10}}$
Option B:	$\frac{1}{\sqrt{5}}$
Option C:	$\frac{9}{\sqrt{10}}$
Option D:	$\frac{2}{\sqrt{5}}$

<table>
<tr><td>Q23.</td><td>Evaluate $\int_c \frac{zdz}{(z-1)(z-2)}dz$ where c is the circle $|z|=3$</td></tr>
<tr><td>Option A:</td><td>$2\pi i$</td></tr>
<tr><td>Option B:</td><td>$6\pi i$</td></tr>
<tr><td>Option C:</td><td>$4\pi i$</td></tr>
<tr><td>Option D:</td><td>$-2\pi i$</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Q24.</td><td>Find values of unknown ‘e’ if following is solution of
$\frac{\partial^2 u}{\partial x^2}-\frac{1}{4}\frac{\partial u}{\partial t}=0,\ given\ u(0,t)=0,\ u(4,t)=0, h=1.$

using Bender-Schmidt method.

<table>
<tr><td>x / t</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td></tr>
<tr><td>a</td><td>c</td><td>3.5</td><td>6</td><td>7.5</td><td>g</td></tr>
<tr><td>b</td><td>d</td><td>e</td><td>5.5</td><td>f</td><td>h</td></tr>
</table>
</td></tr>
<tr><td>Option A:</td><td>3.5</td></tr>
<tr><td>Option B:</td><td>2</td></tr>
<tr><td>Option C:</td><td>3</td></tr>
<tr><td>Option D:</td><td>3.75</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Q25.</td><td>Find the image of interior of circle $|z|=1$ under the transformation $W=\frac{1}{z}$</td></tr>
<tr><td>Option A:</td><td>interior of circle $|w|=1$</td></tr>
<tr><td>Option B:</td><td>Exterior of circle $|w|=1$</td></tr>
<tr><td>Option C:</td><td>$|w|=1$</td></tr>
<tr><td>Option D:</td><td>real axis in W- plane</td></tr>
</table>