

University of Mumbai
Examination 2020 under cluster ___ (Lead College Shortname)

Program: EXTC Engineering

Curriculum Scheme: Rev 2016

Examination: Second Year Semester III

Course Code: ECC 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.	$L(e^{2t} \cos \omega t) = \underline{\hspace{2cm}}$
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.	Find directional derivative of $\phi = x^2 + y^2 + z^2$ in the direction of $i - 2j + 2k$ at point (1,2,3).
Option A:	10/3
Option B:	2/3
Option C:	-2
Option D:	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.	If $\vec{F} = (3x + 2y)i + (5y - 4z)j + (az + x)k$ is solenoidal, find a
Option A:	-2
Option B:	8
Option C:	-8

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Option D:	2
Q6.	Find constants a, b if $f(z) = (3x^2y + 2x^2 + ay^3 - 2y^2) + i(bxy - x^3 + 3xy^2)$ 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.	$L(\int_0^t \int_0^t \int_0^t \sin u \, du^3) = \underline{\hspace{2cm}}$
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:	$\frac{2}{n\pi}$

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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.	Work done in moving a particles in a conservative field under the force $\vec{F} = (2xy + z^3)i + (x^2)j + (3z^2x)k$ from the point (1,-2,1) to (3,1,4) is
Option A:	200 units
Option B:	204 units
Option C:	202 units
Option D:	206 units
Q13.	Evaluate $L^{-1}\left[\frac{1}{(s-2)^4}\right]$.
Option A:	$e^{2t} \frac{t^3}{3!}$
Option B:	$e^{2t} \frac{t^5}{5!}$
Option C:	$e^{-2t} \frac{t^4}{4!}$
Option D:	$e^{-2t} \frac{t^5}{5!}$
Q14.	Use Stoke's Theorem to evaluate $\int_C \vec{F} \cdot d\vec{r}$ where $\vec{F} = x^2i + xyj$ and C is boundary of rectangle $x = 0, x = 1, y = 0, y = 2$
Option A:	$\frac{1}{2}$
Option B:	2
Option C:	4
Option D:	6
Q15.	Using Green's Theorem evaluate $\oint (x^2 - y)dx + (2y^2 + x)dy$ around the boundary of the region $y = x^2, y = x$
Option A:	1/3
Option B:	3
Option C:	1/6
Option D:	-1/3

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Q16.	If $f(z) = r^3 \cos k\theta + ir^k \sin k\theta$ is analytic then $k = \underline{\hspace{2cm}}$.
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) = x $ in $(-\pi, \pi)$ then Fourier Coefficient $a_n = \underline{\hspace{2cm}}$
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.	If S is any closed surface enclosing a volume V and $\bar{A} = (ax)i + (by)j + (cz)k$ then $\iint_S \bar{A} \cdot \hat{n} ds$ is
Option A:	$(a + b + c)V$
Option B:	$a + b + c$
Option C:	$abcV$
Option D:	abc
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.	Select the correct relation.
Option A:	$J'_n(x) = \frac{n}{x} J_n(x) + J_{n-1}(x)$

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Option B:	$J'_n(x) = -\frac{n}{x} J_n(x) - J_{n-1}(x)$
Option C:	$J'_n(x) = -\frac{n}{x} J_n(x) + J_{n-1}(x)$
Option D:	$J'_n(x) = \frac{n}{x} J_n(x) - J_{n-1}(x)$
Q22.	$\int_0^{\infty} e^{-t} \operatorname{erf} 3\sqrt{t} dt = \underline{\hspace{2cm}}$
Option A:	$\frac{3}{\sqrt{10}}$
Option B:	$\frac{1}{\sqrt{5}}$
Option C:	$\frac{9}{\sqrt{10}}$
Option D:	$\frac{2}{\sqrt{5}}$
Q23.	$\int J_3(x) dx = \underline{\hspace{2cm}}$
Option A:	$-J_2(x) - \frac{2}{x} J_1(x)$
Option B:	$-J_2(x) + \frac{2}{x} J_1(x)$
Option C:	$J_2(x) - \frac{2}{x} J_1(x)$
Option D:	$J_2(x) + \frac{2}{x} J_1(x)$
Q24.	$J_{-\frac{3}{2}}(x) = \underline{\hspace{2cm}}$
Option A:	$\sqrt{\frac{2\pi}{x}} \left(\sin x + \frac{\cos x}{x} \right)$
Option B:	$\sqrt{\frac{2\pi}{x}} \left(\sin x - \frac{\cos x}{x} \right)$
Option C:	$-\sqrt{\frac{2\pi}{x}} \left(\sin x + \frac{\cos x}{x} \right)$
Option D:	$-\sqrt{\frac{2\pi}{x}} \left(\sin x - \frac{\cos x}{x} \right)$
Q25.	Find the image of interior of circle $ z =1$ under the transformation $W = \frac{1}{z}$
Option A:	interior of circle $ w =1$
Option B:	Exterior of circle $ w =1$

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Option C:	$ w =1$
Option D:	real axis in W- plane