

Program: BE Electronics Engineering

Curriculum Scheme: Revised 2019

Examination: Second Year Semester III

Course Code: ELC301

Course Name: Engineering Mathematics-III

Time: 2 hour

Max. Marks: 80

Q.1 Multiple Choice Questions

Q1.	Find L[$\sin^2 t$]
Option A:	$\frac{1}{2} \left[\frac{1}{s} - \frac{s}{s^2 + 4} \right]$
Option B:	$\frac{s}{s^2 + 4}$
Option C:	$\frac{1}{2} \frac{s}{s^2 + 4}$
Option D:	$\frac{1}{s}$
Q2.	Find L[$\cos 2t \sin t$]
Option A:	$\frac{3}{s^2 + 9}$
Option B:	$-\frac{1}{s^2 + 1}$
Option C:	$\frac{9}{s^2 + 1}$
Option D:	$\frac{1}{2} \left[\frac{3}{s^2 + 9} - \frac{1}{s^2 + 1} \right]$
Q3.	Find L[$e^t \cos t$]

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Option A:	$\frac{1}{(s+2)^2 + 5}$
Option B:	$\frac{2}{(s+1)^2}$
Option C:	$\frac{s}{(s-1)^2 + 1}$
Option D:	$\frac{2}{s}$
Q4.	Find $L[e^t]$
Option A:	$1 / (s-1)^2$
Option B:	$1 / (s-1)$
Option C:	$2 / s$
Option D:	$3 / (s-1)^2$
Q5.	Find $L^{-1}\left[\frac{s}{s^2 + 4}\right]$
Option A:	$e^{-t} \sin 2t$
Option B:	$\cos 2t$
Option C:	$\sin 2t$
Option D:	e^{-t}

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Q6.	Find $L^{-1}\left[\frac{1}{s+5}\right]$
Option A:	$(1 - e^{25t})$
Option B:	e^{-5t}
Option C:	$1 - e^{-5t}$
Option D:	$e^{-5t} / 5$
Q7.	Find half range sine series for $f(x) = x$ in $(0, \pi)$
Option A:	$-\sum_{n=1}^{\infty} \frac{2(-1)^n}{n} \sin nx$
Option B:	$\sum_{n=1}^{\infty} \frac{1 - (-1)^n}{2n} \cos nx$
Option C:	$\sum_{n=1}^{\infty} \frac{1 - (-1)^n}{2n}$
Option D:	$\sum_{n=1}^{\infty} \cos nx$
Q8.	Which of the following function is odd?
Option A:	$f(x) = x^2$
Option B:	$f(x) = x^2 - x$
Option C:	$f(x) = x$
Option D:	$f(x) = x^3 + x$

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Q9.	The function $f(x) = \sin x$ is periodic function with period
Option A:	π
Option B:	2π
Option C:	3π
Option D:	4π
Q10.	A vector $\vec{F}$ is Irrotational if $\text{curl} \vec{F}$ is
Option A:	1
Option B:	0
Option C:	2
Option D:	4
Q11.	Find the analytic function whose real part is $x^3 - 3xy^2$
Option A:	$z^3 + c$
Option B:	$z + c$
Option C:	$z - c$
Option D:	$3z + c$
Q12.	The integral of the normal component of the curl of a vector over a surface S is equal to the line integral of the tangent component of around the curve bounding S i.e.

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	$\vec{N} \cdot (\nabla \times \vec{F}) ds = \int_C \vec{F} \cdot d\vec{r}$ where $\vec{N}$ is the unit outward normal vector to the element ds.
Option A:	Stoke's Theorem
Option B:	Green's Theorem
Option C:	Gauss-Divergence Theorem
Option D:	Pythagoreans Theorem
Q13.	If $f(z) = r^2 \cos 2\theta + ir^2 \sin p\theta$ is analytic then the value of 'p' is
Option A:	3
Option B:	2
Option C:	4
Option D:	-2
Q14.	Find a_0 of the function $f(x) = \frac{1}{4}(\pi - x)^2$
Option A:	$\frac{\pi^2}{6}$
Option B:	$\frac{\pi^2}{12}$
Option C:	$\frac{5\pi^2}{6}$

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Option D:	$\frac{5\pi^2}{12}$
Q15.	If $\vec{F} = x^2 \vec{i} + xy \vec{j} + y^2 \vec{k}$ then $\text{div} \vec{F}$ is
Option A:	X
Option B:	2x
Option C:	3x
Option D:	4x
Q16.	If 1, 2 & 3 are eigen values of matrix A then eigen values of matrix A^3 are
Option A:	1, 8 & 27
Option B:	1, 4 & 9
Option C:	2, 3 & 2
Option D:	0, 3 & 9
Q17.	Find $\text{grad}(\phi)$ if $\phi = 2x^2 + y^2$
Option A:	$x \vec{i} - y \vec{j} - z \vec{k}$
Option B:	$4x \vec{i} + 2y \vec{j}$
Option C:	$x \vec{i} + y \vec{j} + z \vec{k}$
Option D:	$x \vec{i} - z \vec{k}$
Q18.	If $\text{div} \vec{F} = 0$ then $\vec{F}$ is
Option A:	Solenoidal

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Option B:	Irrotational
Option C:	Convergent
Option D:	Constant
Q19.	Evaluate $\int_A^B (2y dx + x dy)$ along $y = x$ from A(0,0) to B(2,2)
Option A:	1
Option B:	6
Option C:	-1
Option D:	3
Q20.	If $\vec{F} = i - xy j + y^2 k$ then $\text{curl} \vec{F}$ is
Option A:	$(2y - x) i + y j - 2y k$
Option B:	$x i + y j + z k$
Option C:	$z i - y k$
Option D:	$i + 3 j + 2 k$

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Q.2 Attempt any Four [20 M]

A) Find $L^{-1}\left[\frac{s^2}{(s+a)^2}\right]$ using convolution theorem [05 M]

B) Find Fourier series for $f(x) = x^2$ in $(0, 2\pi)$ [05 M]

C) Evaluate by Green's theorem $(x^2 - xy)dx + (x^2 - y^2)dy$
where C is the closed curve bounded by $x^2 = 2y$ and $x = y$ [05 M]

D) Show that $\vec{F} = (y^2 - z^2 + 3yz - 2x)\mathbf{i} + (3xz + 2xy)\mathbf{j} + (3xy - 2xz + 2z)\mathbf{k}$ is both solenoidal and irrotational. [05 M]

E) Show that the matrix $A = \begin{bmatrix} 8 & -8 & -2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix}$ is diagonalisable. Find the transforming

matrix and the diagonal form. [05 M]

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Q.3 Attempt any Four [20 M]

A) Find the eigen values & eigen vectors for the matrix $A = \begin{bmatrix} 8 & -8 & -2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix}$

B) Find half range cosine series for $f(x)=x$ in $(0,2)$.

C) Show that $u = x^3y - xy^3$ is a harmonic function. Find its harmonic conjugate and analytic function

D) If $\vec{F} = (axy + bz^3)\mathbf{i} + (3x^2 - cz)\mathbf{j} + (3xz^2 - y)\mathbf{k}$

is irrotational, find the value of a, b & c.

E) Find $L\left[\frac{\sin^2 t}{t}\right]$