

Program: FE

Curriculum Scheme: Revised 2019

Examination: First Year Semester I

Course Code: FEC101

Course Name: Engineering Mathematics-I

Time: 1 hour

Max. Marks: 50

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

Q1.	If $1, \omega, \omega^2$ are cube roots of unity, then ω is given by
Option A:	$\sin\left(\frac{2\pi}{3}\right) + i\cos\left(\frac{2\pi}{3}\right)$
Option B:	$\cos\left(\frac{2\pi}{3}\right) + i\sin\left(\frac{2\pi}{3}\right)$
Option C:	$\cos\left(\frac{4\pi}{3}\right) + i\sin\left(\frac{4\pi}{3}\right)$
Option D:	None of these
Q2.	The number $\frac{(1+i\sqrt{3})^{17}}{(\sqrt{3}-i)^{15}}$ can be written in polar form as
Option A:	$4\left(\cos\frac{\pi}{6} + i\sin\frac{\pi}{6}\right)$
Option B:	$8\left(\cos\frac{\pi}{6} + i\sin\frac{\pi}{6}\right)$
Option C:	$4\left(\cos\frac{\pi}{5} + i\sin\frac{\pi}{5}\right)$
Option D:	None of these
Q3.	The solution of equation $5\sinh x - \cosh x = 5$ is
Option A:	$x = \log 3, \log\left(-\frac{1}{2}\right)$
Option B:	$x = \log\left(\frac{1}{3}\right), \log\left(\frac{1}{2}\right)$
Option C:	$x = \log\left(\frac{1}{3}\right), \log 2$
Option D:	None of these
Q4.	$\log(1+i) =$
Option A:	$\log 2 + i\frac{\pi}{4}$
Option B:	$\frac{1}{2}\log 2 + i\frac{\pi}{4}$
Option C:	$\frac{1}{2}\log 2 + \frac{\pi}{4}$
Option D:	None of these

Q5.	What are the roots of the equation $z^2 - i = 0$?
Option A:	$\cos \frac{\pi}{2} + i \sin \frac{\pi}{2}, \cos \frac{\pi}{4} + i \sin \frac{\pi}{4}$
Option B:	$1, \cos \frac{\pi}{2} + i \sin \frac{\pi}{2}$
Option C:	$\cos \frac{\pi}{2} + i \sin \frac{\pi}{2}, \cos \frac{5\pi}{4} + i \sin \frac{5\pi}{4}$
Option D:	None of these
Q6.	$\cos 5\theta$ can be written in terms of powers of $\cos \theta$ as
Option A:	$5\cos \theta - 20\cos^3 \theta + 16\cos^5 \theta$
Option B:	$\cos \theta + 20\cos^3 \theta + 16\cos^5 \theta$
Option C:	$5\cos \theta + 16\cos^3 \theta + 20\cos^5 \theta$
Option D:	None of these
Q7.	The solution of the following system $x - y + z = 0, x + 2y + z = 0, 2x + y + 3z = 0$ is
Option A:	$x = 2, y = 1, Z = 0$
Option B:	$x = 0, y = 1, Z = 2$
Option C:	$x = 3, y = 0, Z = 0$
Option D:	$x = 0, y = 0, Z = 0$
Q8.	If $A = \begin{bmatrix} 3 & 2 & 5 & 7 & 12 \\ 1 & 1 & 2 & 3 & 5 \\ 3 & 3 & 6 & 9 & 15 \end{bmatrix}$ then $\text{rank}(A) =$
Option A:	2
Option B:	3
Option C:	0
Option D:	4
Q9.	If $A = \frac{1}{3} \begin{bmatrix} -2 & 1 & 2 \\ 2 & 2 & 1 \\ 1 & -2 & 2 \end{bmatrix}$ is orthogonal then $A^{-1} =$
Option A:	$\frac{1}{9} \begin{bmatrix} -2 & 1 & 2 \\ 2 & 2 & 1 \\ 1 & -2 & 2 \end{bmatrix}$
Option B:	$\frac{1}{3} \begin{bmatrix} 0 & 5 & 2 \\ 2 & 2 & 1 \\ 1 & 8 & 2 \end{bmatrix}$
Option C:	$\frac{1}{3} \begin{bmatrix} -2 & 2 & 1 \\ 1 & 2 & -2 \\ 2 & 1 & 2 \end{bmatrix}$

Option D:	$\frac{1}{3} \begin{bmatrix} -2 & 1 & 0 \\ 2 & 2 & 1 \\ 0 & -2 & 2 \end{bmatrix}$
Q10.	Find a,b,c if $A = \frac{1}{9} \begin{bmatrix} -8 & 4 & a \\ 1 & 4 & b \\ 4 & 7 & c \end{bmatrix}$ is orthogonal
Option A:	a=1, b=-8,c=4
Option B:	a=0, b=5,c=4
Option C:	a=-8, b=1,c=4
Option D:	a=1, b=4,c=0
Q11.	Find the value of P for which the matrix A will have rank =1 , where $A = \begin{bmatrix} 3 & p & p \\ p & 3 & p \\ p & p & 3 \end{bmatrix}$
Option A:	P=0
Option B:	P=1
Option C:	P=27
Option D:	P=3
Q12.	The solution of $x + y + z = 3, x + 2y + 3z = 4, x + 4y + 9z = 6$ is
Option A:	$x = 2, y = 1, Z = 0$
Option B:	$x = 0, y = 1, Z = 2$
Option C:	$x = 3, y = 0, Z = 0$
Option D:	$x = 1, y = 1, Z = 1$
Q13.	1. If $z = \tan^{-1} \frac{y}{x}$ find $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2}$
Option A:	0
Option B:	$\frac{4xy}{(x^2 + y^2)^2}$
Option C:	$\frac{-4xy}{(x^2 + y^2)^2}$
Option D:	None of these
Q14.	If $z = \log(u + v)$ $u = e^{x+y}; v = x + y$ Find, $\frac{\partial z}{\partial x}$
Option A:	$\frac{u-1}{u+v}$
Option B:	$\frac{u+1}{u+v}$

Option C:	$\frac{u-1}{u-v}$
Option D:	None of these
Q15.	If $u = \frac{f(\theta)}{r}$ where $x = r \cos \theta, y = r \sin \theta$ find $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = -u$
Option A:	$2u$
Option B:	u
Option C:	$-u$
Option D:	None of these
Q16.	1. If $u = \frac{1}{\sqrt{x^2 + y^2 + z^2}}$; $x^2 + y^2 + z^2 \neq 0$ Find the value of $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2}$
Option A:	0
Option B:	$\frac{1}{(x^2 + y^2 + z^2)^{\frac{3}{2}}}$
Option C:	6
Option D:	-6
Q17.	If $u = \frac{e^{x+y+z}}{e^x + e^y + e^z}$ Find $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z}$
Option A:	0
Option B:	$\frac{u}{2}$
Option C:	$-2u$
Option D:	$2u$
Q18.	Find $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y}$ for $u = (8x^2 + y^2)(\log x - \log y)$
Option A:	0
Option B:	1
Option C:	$-2u$
Option D:	$2u$
Q19.	Find the n^{th} derivative of $y = \frac{x}{1+3x+2x^2}$
Option A:	0

Option B:	$(-1)^n n! \left[\frac{1}{(x-2)^{n+1}} - \frac{1}{(x-1)^{n+1}} \right]$
Option C:	$(-1)^n n! \left[\frac{1}{(x-2)^{n+1}} + \frac{1}{(x-1)^{n+1}} \right]$
Option D:	None of these
Q20.	The expansion of $e^{\sin x}$ is
Option A:	$1 + x + \frac{x^2}{2} + \frac{x^4}{8} + \dots$
Option B:	$1 + x + \frac{x^2}{2} - \frac{x^4}{8} + \dots$
Option C:	$1 + x - \frac{x^2}{2} + \frac{x^4}{8} + \dots$
Option D:	$1 + x + \frac{x^3}{6} - \frac{x^5}{10} + \dots$
Q21.	Expansion of function $f(x)$ is
Option A:	$1 + \frac{x}{1!} f'(0) + \frac{x^2}{2!} f''(0) + \dots + \frac{x^n}{n!} f^n(0)$
Option B:	$f(0) + \frac{x}{1!} f'(0) + \frac{x^2}{2!} f''(0) + \dots + \frac{x^n}{n!} f^n(0)$
Option C:	$f(0) - \frac{x}{1!} f'(0) + \frac{x^2}{2!} f''(0) - \dots + (-1)^n \frac{x^n}{n!} f^n(0)$
Option D:	$f(1) + \frac{x}{1!} f'(0) + \frac{x^2}{2!} f''(0) + \dots + \frac{x^n}{n!} f^n(0)$
Q22.	Expansion of $f(x) = \log(1 + e^x)$ is
Option A:	$\log(2) + \frac{x}{2} + \frac{x^2}{8} - \frac{x^4}{192} + \dots$
Option B:	$\log(2) + \frac{x}{2} + \frac{x^2}{8} + \frac{x^4}{192} + \dots$
Option C:	$\log(2) + \frac{x}{2} + \frac{x^3}{8} - \frac{x^5}{192} + \dots$
Option D:	$\log(2) + \frac{x}{2} + \frac{x^3}{8} + \frac{x^5}{192} + \dots$
Q23.	Which of the following system of linear equations has a strictly diagonally dominant co-efficient matrix?
Option A:	$5x+2y+2z=7$ $3x+1y+5z=6$ $2x+8y+3z=5$
Option B:	$5x+1y+2z=6$ $1x+1y+8z=1$ $1x+6y+3z=7$

Option C:	$5x+1y+2z=7$ $1x+6y+3z=6$ $1x+1y+8z=5$
Option D:	$2x-4y+49z=49$ $43x+2y+25z=23$ $3x+53y+3z=91$
Q24.	<p>Solve the following equation by gauss seidel Method upto 2 iterations and find the value of z.</p> $27x+6y-z=85$ $6x+15y+2z=72$ $x+y+54z=110$
Option A:	1.88
Option B:	1.22
Option C:	0
Option D:	1.92
Q25.	<p>Solve the system of equation by Jacobi's iteration method (take three iterations)</p> $10x+y+z=12$ $x+10y+z=12$ $x+y+10z=12$
Option A:	$x = 1, y = 1, z = 1$
Option B:	$x = 1, y = 2, z = 1$
Option C:	$x = 1, y = 1, z = 2$
Option D:	$x = 2, y = 2, z = 2$