University of Mumbai
Examination 2020

Program: F.E. (All Branches)
Curriculum Scheme: R-2019 'C' Scheme
Examination: First Year Semester I
Course Code: FEC101 and Course Name: Engineering Mathematics-I
Time: 1 hour Max. Marks: 50

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

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Q1.	If $p = e^{2i\alpha}, q = e^{2i\beta}$, then $\left(\frac{q}{p}\right)^{1/2} - \left(\frac{p}{q}\right)^{1/2} =$ .....
Option A:	$2\ cos\ 2(\alpha - \beta)$
Option B:	$2isin(\beta - \alpha)$
Option C:	$2i\ \sin sin\ (\alpha - \beta)$
Option D:	$2\ cos2(\beta - \alpha)$
Q2.	Test for consistency and if consistent then find the value of z $x + y + z = 3; x + 2y + 3z = 4; x + 4y + 9z = 6$
Option A:	Consistent ; z=0
Option B:	Consistent ; z=1
Option C:	Inconsistent
Option D:	Consistent ; z=2
Q3.	Roots of $x^6 - i = 0$ are
Option A:	$cos(4k + 1)\frac{\pi}{6} + isin(4k + 1)\frac{\pi}{6}\ ; k = 0, 1...6$
Option B:	$cos(4k + 1)\frac{\pi}{6} + isin(4k + 1)\frac{\pi}{6}\ ; k = 0, 1...5$
Option C:	$cos(4k + 1)\frac{\pi}{12} + isin(4k + 1)\frac{\pi}{12}\ ; k = 0, 1...5$
Option D:	$cos(4k + 1)\frac{\pi}{12} + isin(4k + 1)\frac{\pi}{12}\ ; k = 0, 1...6$
Q4.	If $A = [1\ 0\ 0\ 0\ -\ 1\ 0\ 0\ 0\ 3\ ]$, then rank of A is
Option A:	2
Option B:	3
Option C:	1
Option D:	0
Q5.	Amplitude and modulus of $z = 1 + cosa - isina$ are_____ respectively
Option A:	$\pi - \frac{a}{2}$ & $\frac{a}{2}$
Option B:	$-\ a/2$ & $\frac{a}{2}$
Option C:	$\cos cos\ \frac{a}{2}$ & $\frac{a}{2}$

Option D:	tan $tan\ \frac{a}{2}$ & $a/2$
Q6.	Stationary point is a point where f(x,y) has
Option A:	$\frac{\partial f}{\partial x} = 0$
Option B:	$\frac{\partial f}{\partial y} = 0$
Option C:	$\frac{\partial f}{\partial x} = 0$, $\frac{\partial f}{\partial y} = 0$
Option D:	$\frac{\partial f}{\partial x} < 0$ $\frac{\partial f}{\partial x} > 0$
Q7.	Let A=[5 7 − 3 4] be expressed as P+Q, where P is a symmetric matrix and Q is a skew symmetric matrix. Which one of the following is correct?
Option A:	Q=[0 − 5 5 0]
Option B:	Q=$\frac{1}{2}$[5 − 3 7 4]
Option C:	Q=$\frac{1}{2}$[0 10 − 10 0]
Option D:	Q=$\frac{1}{2}$[5 10 − 10 0]
Q8.	Find the value of log $log\ (\sqrt{3}$ - i)
Option A:	$log4 + i\frac{\pi}{6}$
Option B:	$log2 + i\frac{\pi}{6}$
Option C:	$log4 - i\frac{\pi}{6}$
Option D:	$log2 - i\frac{\pi}{6}$
Q9.	The Taylor's series for $f(x) = 2x^3 + 7x^2 + x - 1$ at x=2 is given by $a + b(x-2) + c(x-2)^2 + d(x-2)^3$. Find the value of (a+b+c+d)
Option A:	117
Option B:	66
Option C:	119
Option D:	-113
Q10.	Consider System AX = 0, where A is n x n matrix and X is n x 1 unknown column vector, This system will have infinite solution if
Option A:	Rank A = n

Option B:	Rank A > n
Option C:	Rank A < n
Option D:	Rank A = n+1
Q11.	Which of the following is false
Option A:	$\sinh sinh\, x = \frac{e^x - e^{-x}}{2i}$
Option B:	$tanix = itanhx$
Option C:	$cosech^2 x = coth^2 x - 1$
Option D:	$\sin^2 x + \cos^2 x = 1$
Q12.	If $u = \log log\,(tanx + tany)$ then $\sin sin\, 2x\frac{\partial u}{\partial x} + \sin sin\, 2y\frac{\partial u}{\partial y} =$
Option A:	0
Option B:	1
Option C:	-1
Option D:	2
Q13.	$\sec sec\,\theta\ ) =$
Option A:	$log(\sec sec\,\theta + \sqrt{\theta + 1})$
Option B:	$log(\sec sec\,\theta - \sqrt{\theta + 1}$
Option C:	$log(\sec sec\,\theta - tan\theta)$
Option D:	$log(\sec sec\,\theta + tan\theta)$
Q14.	Is the matrix $A=\frac{1}{\sqrt{3}}[1\ 1+i\ 1-i\ -1\ ]$ Unitary? If yes, then find its inverse.
Option A:	Not Unitary
Option B:	Unitary , $A^{-1} = A^T$
Option C:	Unitary , $A^{-1} = A^*$
Option D:	Unitary , $A^{-1} = \overline{A}$
Q15.	$(\cosh cosh\, x - \sinh sinh\, x\ )^n =$
Option A:	$x + x$
Option B:	$x - \sinh sinh\, nx$
Option C:	$nx - i\sin sin\, nx$
Option D:	$nx - i\sinh sinh\, nx$
Q16.	If $x = rcos\theta$, $y = rsin\theta$ then $x\left(\frac{\partial x}{\partial r}\right) + y\left(\frac{\partial y}{\partial r}\right) =$
Option A:	$x^2 + y^2$
Option B:	r
Option C:	$cos\theta$
Option D:	$\sin sin\,\theta$
Q17.	If $A_{3\times 3}$ is an orthogonal matrix then rank of matrix A is
Option A:	0

Option B:	1
Option C:	2
Option D:	3
Q18.	If $u = f(x - y, y - z, z - x)$, then $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} =$
Option A:	3
Option B:	1
Option C:	0
Option D:	-1
Q19.	If $u = \frac{x^2+y^2}{x^5+y^5}$ then $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} =$
Option A:	-3u
Option B:	2u
Option C:	$\frac{1}{3}u$
Option D:	-2u
Q20.	If $u = \left(\frac{x^3+y^3}{x-y}\right)$ then $x^2\frac{\partial^2 u}{\partial x^2} + 2xy\frac{\partial^2 u}{\partial x \partial y} + y^2\frac{\partial^2 u}{\partial y^2} =$
Option A:	$\sin sin\ 4u - \cos cos\ 2u$
Option B:	$\cos cos\ 4u - \sin sin\ 2u$
Option C:	$\cos cos\ 4u - \cos cos\ 2u$
Option D:	$\sin sin\ 4u - \sin sin\ 2u$
Q21.	If $y = a\cos cos\ (\log log\ x) + bsin(logx)$ then
Option A:	$x^2y_2 - xy_1 - y = 0$
Option B:	$x^2y_2 + xy_1 - y = 0$
Option C:	$x^2y_2 + xy_1 + y = 1$
Option D:	$x^2y_2 + xy_1 + y = 0$
Q22.	Evaluate $\frac{(1+i\sqrt{3})^{17}}{(\sqrt{3}-i)^{15}}$
Option A:	$4(cos\frac{\pi}{6} + isin\frac{\pi}{6})$
Option B:	$4(cos\frac{\pi}{3} + isin\frac{\pi}{3})$
Option C:	$\frac{1}{4}(cos\frac{\pi}{3} + isin\frac{\pi}{3})$
Option D:	$\frac{1}{4}(cos\frac{\pi}{6} + isin\frac{\pi}{6})$

Q23.	Solve the following equation by Gauss Seidal Method up to 2 iterations and find the value of z. 20x + y - 2z = 17 3x + 20y - z = -18 2x - 3y + 20z = 25
Option A:	1.88
Option B:	1.22
Option C:	0
Option D:	0.9998
Q24.	In Regula Falsi Method , the first approximation is given by
Option A:	$x_1 = \frac{af(b)-bf(a)}{f(b)-f(a)}$
Option B:	$x_1 = \frac{bf(b)-af(a)}{f(b)-f(a)}$
Option C:	$x_1 = \frac{af(a)-bf(b)}{f(a)-f(b)}$
Option D:	$x_1 = \frac{bf(b)-af(a)}{f(a)-f(b)}$
Q25.	The equation f(x) is given as $x^3 - 2x - 5 = 0$. Solve using Newton Raphson Method, considering the initial approximation at x=2 then the value of next approximation correct up to 2 decimal places is given as _____
Option A:	2.08
Option B:	2.09
Option C:	2.06
Option D:	2.10

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Question Number	Correct Option (Enter either 'A' or 'B' or 'C' or 'D')
Q1.	B
Q2.	A
Q3.	C
Q4	B
Q5	B
Q6	C
Q7	C
Q8.	D
Q9.	C
Q10.	C
Q11.	A
Q12.	D
Q13.	D
Q14.	C
Q15.	B
Q16.	B
Q17.	D
Q18.	C
Q19.	A
Q20.	D
Q21.	D
Q22.	A
Q23.	D
Q24.	A
Q25.	B