University of Mumbai

Examination 2021

Program: -BE

Curriculum Scheme: Rev-2019 C" Scheme

Examination: First Year Semester I

Course Code: FEC101 and Course Name: Applied Mathematics I

Time: 2 hour | Max. Marks:80

All the Questions are compulsory and carry equal marks .

Q1.	cos(hz) =
Option A:	$\log(z+\sqrt{z^2 -1})$
Option B:	$\log(z-\sqrt{z^2 -1})$
Option C:	$\log(z^2 + z-1)$
Option D:	$\log(z^2 + z +1)$
Q2.	What is the value of $(1+i)^{100} + (1 -i)^{100}$
Option A:	2^{51}
Option B:	-2^{51}
Option C:	2^{50}
Option D:	0
Q3.	If α and β are roots of the equation $x^2+ x +1$ then $\alpha^n +\beta^n =$
Option A:	$2\cos(2n\pi/3)$
Option B:	$2\tan(2n\pi)$
Option C:	$2 \sin(2n\pi)$
Option D:	$-2\cos(2n\pi/3)$
Q4.	If $\sin^3\theta \cos^4\theta = a_1\cos\theta +a_3 \cos3\theta +a_5\cos5\theta +a_7\cos7\theta$ then $a_1 +9a_3 +5a_5 + 49a_7 =$
Option A:	1
Option B:	2
Option C:	3
Option D:	0
Q5.	If $\alpha\ \beta\ \gamma\ \sigma$ are the roots of the equation $x^4 +x^3+x^2+x +1 =0$ then $(1-\alpha)(1-\beta)(1-\gamma)(1-\sigma) =$
Option A:	5
Option B:	4
Option C:	3

Option D:	2
Q6.	Represent i^i in terms of e.
Option A:	e⁻π/3
Option B:	e−3π/2
Option C:	e−π/2
Option D:	e−π/6
Q7.	Rank of the matrix. $\begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$ is …
Option A:	3
Option B:	0
Option C:	2
Option D:	1
Q8.	Every skew Hermition matrix can be expressed as …..
Option A:	P+iQ
Option B:	P -iQ
Option C:	P
Option D:	Q
Q9.	For a homogeneous function if critical points exist the value at critical points is?
Option A:	1
Option B:	equal to its degree
Option C:	0
Option D:	-1
Q10.	The point (0,0) in the domain of f(x, y) = sin(xy) is a point of ____________
Option A:	Saddle
Option B:	Minima
Option C:	Maxima
Option D:	Constant
Q11.	Test for consistency and solve to find the value of x. 5x + 3y + 7z = 4, 3x + 26y + 2z = 9, 7x + 2y + 10z = 5
Option A:	Consistent, x=1
Option B:	Consistent, x=-1
Option C:	Inconsistent system, solution does not exist
Option D:	Consistent, infinite number of solutions possible

Q12.	For what value of p the rank of matix $\begin{bmatrix} 3 & 1 & 2 \\ -1 & 4 & 5 \\ 7 & 2 & p \end{bmatrix}$ is equal to 3
Option A:	p = 55
Option B:	p = 13
Option C:	$P \neq \frac{55}{13}$
Option D:	$P \neq \frac{13}{55}$
Q13.	In Euler theorem x ∂z/∂x + y ∂z/∂y = nz, here ‘n’ indicates?
Option A:	order of z
Option B:	degree of z
Option C:	neither order nor degree
Option D:	constant of z
Q14.	Value of $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y}$ if $u = \frac{Sin^{-1}(\frac{y}{x})(\sqrt{x}+\sqrt{y})}{x^3+y^3}$ is?
Option A:	-2.5 u
Option B:	-1.5 u
Option C:	0
Option D:	-0.5 u
Q15.	For two complex numbers p and q, if Arg(p)-Arg(q)=π/2 as well as |pq|=1, what is the value of $\bar{p}q$?
Option A:	-i
Option B:	-1
Option C:	i
Option D:	1
Q16.	If y = $x^n \log x$ then y_{n+1} = …
Option A:	$\frac{n!}{x}$
Option B:	$x/1!+x^3/3!+x^5/5!….\infty$
Option C:	$1+x^2/2!+x^4/4!+….\infty$
Option D:	$1+x/1!+x^2/2!+….\infty$
Q17.	If y = $\frac{1}{x}$ then y_{70} =
Option A:	70
Option B:	$\frac{70!}{x^{71}}$
Option C:	$\frac{60!}{x^{61}}$
Option D:	60

Q18.	If $A_{3\times3}$ is matrix and $\|A\| \neq 0$ then rank of A is
Option A:	>3
Option B:	=3
Option C:	≤2
Option D:	<1
Q19.	Real Part of sin(x +iy) =
Option A:	sin(x)
Option B:	cos(y)
Option C:	sin(x) cos(hy)
Option D:	sin(x)sin(hy)
Q20.	The argument of(1-i√3)/(1+i√3)
Option A:	210^o
Option B:	90^o
Option C:	240^o
Option D:	45^o

Q2. (20 Marks)	**Solve any Four out of Six 5 marks each**
A	Show that all the roots of $[x+1]^6$ + $[x-1]^6$ =0 are given by -icot$[\frac{2k+1}{12}]\pi$ where k = 0,1,2,3,4,5.
B	Separate into Real and Imaginary parts of $\cos^{-1}\frac{3i}{4}$.
C	Verify Euler's theorem for u = $\log[\frac{xy+yz+zx}{x^2+y^2+z^2}]$
D	Find the extreme values of $x^3+3xy^2-15x^2-15y^2+72x$
E	Find two non singular matrices P and Q such that PAQ is in normal form and hence find the rank of A. $\begin{bmatrix}1 & 1 & 1\\ 1 & -1 & -1\\ 3 & 1 & 1\end{bmatrix}$
F	Find nth derivative of the following : a) $x^3\cos x$

	b) $x^2 e^x \cos x$

Q3. **(20 Marks)**	**Solve any Four out of Six 5 marks each**
A	Expand $\frac{\sin 7\theta}{\sin\theta}$ in power of $\sin\theta$
B	Reduce the following matrices in to normal form and find the rank $\begin{bmatrix} -1 & 2 & 3 & -2 \\ 2 & -5 & 1 & 2 \\ 3 & -8 & 5 & 2 \\ 5 & -12 & -1 & 6 \end{bmatrix}$
C	Divide 24 into 3 parts such that the continued product of the first, square of second and cube of the third is maximum
D	Express the relation in $\alpha, \beta, \gamma, \delta$ for which A = $\begin{bmatrix} \alpha + i\gamma & -\beta + i\delta \\ \beta + i\delta & \alpha - i\gamma \end{bmatrix}$
E	If u = $\log[\tan(\frac{\pi}{4} + \frac{\theta}{2})]$ prove that i) $\cos hu = \sec\theta$ ii) $\sin hu = \tan\theta$
F	Find the Common roots of $x^4+1=0$ and $x^6-1=0$.