# University of Mumbai

## Examination 2020

Program: BE Engineering

Curriculum Scheme: Rev2016/2012/2019

Examination: First Year Semester I

Course Code: FEC101 and Course Name: Applied Mathematics I

Time: 2 hour Max. Marks:80

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

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| 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: | $\log(z^2+z+1)$ |
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| 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 |
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| Q3. | If $\alpha$ and $\beta$ 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: | $-2\cos(2n\pi/3)$ |
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| 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 |
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| Q5. | If $\alpha\ \beta\ \gamma\ \sigma$ are the roots of the equation $x^4+x^3+x^2+x+1=0$ then $(1-\alpha)(1-\beta)(1-\gamma)(1-\sigma) =$ |

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| Option A: | 5 |
| Option B: | 4 |
| Option C: | 3 |
| Option D: | 2 |
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| Q6. | Represent $i^{i}$ in terms of e. |
| Option A: | $e^{-} \pi/3$ |
| Option B: | $e-3\pi/2$ |
| Option C: | $e-\pi/2$ |
| Option D: | $e-\pi/6$ |
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| Q7. | The Taylor series for $f(x)=7x^2-6x+1$ at $x=2$ is given by $a+b(x-2)+c(x-2)^2$. Find the value of a+b+c. |
| Option A: | -1 |
| Option B: | 0 |
| Option C: | 17 |
| Option D: | 46 |
| | |
| Q8. | $f(x, y)=x^3+y^3x^9 +y^9 x^8 +y^9 {}^9$ find the value of fy at (x,y) = (0,1). |
| Option A: | 101 |
| Option B: | -96 |
| Option C: | 210 |
| Option D: | 0 |
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| 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 |
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| 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 |

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| Option C: | Inconsistent system, solution does not exist |
| Option D: | Consistent, infinite number of solutions possible |
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| Q12. | Solve the following equations using Gauss Elimination Method and find the value of x and z. x + y + 2z + 3w = 1, 2x + 3y - 2z + 4w = 2, 2x + 3y + z - w = 0, 3x - 2y + z - 3w = 3 |
| Option A: | x=1.1 and z=-0.2 |
| Option B: | x=0.3 and z=-0.2 |
| Option C: | x=1.1 and z=0.3 |
| Option D: | x=0.3 and z=-0.6 |
| | |
| 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 |
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| 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. | Find the Taylor series expansion of the function cosh(x) centered at x = 0. |
| Option A: | $1-x^2/2!+x^4/4!+\ldots\infty$ |
| Option B: | $x/1!+x^3/3!+x^5/5!\ldots\infty$ |
| Option C: | $1+x^2/2!+x^4/4!+\ldots\infty$ |
| Option D: | $1+x/1!+x^2/2!+\ldots\infty$ |
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| Q17. | Let Mclaurin series of some f(x) be given recursively, where an denotes the coefficient of x□ in the expansion. Also given an = |

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| | $a_{\square-1}$ / n and $a_0$ = 1, which of The following functions could be f(x)? |
| Option A: | $e^x$ |
| Option B: | $e^{2x}$ |
| Option C: | $c + e^x$ |
| Option D: | No closed form exists |
| | |
| Q18. | If every minor of order 'r' of a matrix is zero then ρ (A) =? |
| Option A: | >r |
| Option B: | =r |
| Option C: | ≤r |
| Option D: | <r |
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| 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 ) |
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| Q20. | The argument of( 1-i√3)/(1+i√3) |
| Option A: | $210^0$ |
| Option B: | $90^0$ |
| Option C: | $240^0$ |
| Option D: | $45^0$ |
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| **Q2.** **(20 Marks)** | **Solve any Four out of Six 5 marks each** |
| **A** | By using newton Raphson method find approximate root of $x^3 - x - 1 = 0$ upto two approximation by taking initial root 1. |
| **B** | Using Regualr falsi method find the root of function $x^2 - 2x - 1 = 0$. |
| **C** | Find the Taylor Series for the function $f(x)=e^{-6x}$ about x=-4. |
| **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. |

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| | $\begin{bmatrix} 1 & 1 & 1 \\ 1 & -1 & -1 \\ 3 & 1 & 1 \end{bmatrix}$ |
| **F** | Solve the following system of equations by Gauss elimination method<br>x+2y+3z=14, 4x+5y+7z=35, 3x+3y+4z=21 |

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| **Q3.**<br>**(20 Marks)** | **Solve any Four out of Six 5 marks each** |
| **A** | By using newton Raphson method find approximate root of $x^3 - x - 1 = 0$ upto two approximation by taking initial root 1. |
| **B** | Reduce the following matrices in to normal form and find the rank<br>$\begin{bmatrix} -1 & 2 & 3 & -2 \\ 2 & -5 & 1 & 2 \\ 3 & -8 & 5 & 2 \\ 5 & -12 & -1 & 6 \end{bmatrix}$ |
| **C** | By using newton Raphson method find approximate value of $\sqrt{10}$ perform three iterations. |
| **D** | Solve using jacobis iterative method 54x+y+z=110 , 2x+15y+6z=72 ,-x+6y+27z=85. |
| **E** | Find the value of log2(-3). |
| **F** | The Common roots of $x^4$ +1 =0and $x^6$ -1 =0 are |