

K. J. Somaiya College of Engineering, Mumbai-77
(Constituent College of Somaiya Vidyavihar University, Mumbai)

Semester: I Oct 2021-Feb 2022

In-Semester Examination

Class: F.Y. B. Tech

Branch: All Branches

Full name of the course: Applied Mathematics-I

Duration: 1hr.15 min (attempting questions) +20 min (uploading)

Semester : I

Course Code: 116U06C101

Max. Marks: 30

Q. No	Questions	Marks
Q1	Choose the correct option from the following MCQ (2 Marks Each)	10 marks
1.1	Which of the following is Correct ? (A) $\sinh x = \frac{e^x - e^{-x}}{2i}$ (B) $\tanh x = i \tanh x$ (C) $\operatorname{cosech}^2 x = \coth^2 x - 1$ (D) $\cosh^2 x = \sinh^2 x - 1$	
1.2	If $p = \cos 4\alpha - i \sin 4\alpha$, $q = \cos 4\beta - i \sin 4\beta$, then $\left(\frac{q}{p}\right)^{\frac{1}{4}} - \left(\frac{p}{q}\right)^{\frac{1}{4}} =$ (A) $2 \cos 3(\alpha - \beta)$ (B) $-2i \sin(\beta - \alpha)$ (C) $2i \sin(\alpha - \beta)$ (D) $-2 \cos(\beta - \alpha)$	
1.3	Real part of $\cos^{-1}(i)$ is (A) $\frac{\pi}{4}$ (B) $\frac{\pi}{2}$ (C) π (D) 0	
1.4	For $A = \begin{bmatrix} 3 & -2 & 5 \\ 0 & 1 & -4 \\ -6 & 5 & -14 \end{bmatrix}$ and any column vector $B \in R^3$, the system $AX = B$ will be inconsistent if $\operatorname{rank}(A B)$ is (A) 0 (B) 1 (C) 2 (D) 3	
1.5	If A is any square Matrix then which of the following is correct ? (A) If A is orthogonal then AA^T is not orthogonal. (B) $i(A - A^{\theta})$ is skew Hermitian. (C) For Hermitian Matrix A, $\overline{iA} = iA^t$ (D) For Unitary Matrix A, AA^{θ} is not Hermitian.	

Q2	Attempt any Two of the following	
(a)	Find the roots of $(x + 1)^7 = (x - 1)^7$	5 marks
(b)	If $\cos(u + i v) = x + i y$, Prove that $(1 + x)^2 + y^2 = (\cosh v + \cos u)^2$	5 marks
(c)	If $a \cos \alpha + b \cos \beta + c \cos \gamma = a \sin \alpha + b \sin \beta + c \sin \gamma = 0$, Prove that $a^3 \cos 3\alpha + b^3 \cos 3\beta + c^3 \cos 3\gamma = 3abc \cos(\alpha + \beta + \gamma)$	5 marks
Q3	Attempt any Two of the following	
(a)	Determine the values of a, b, c For orthogonal matrix $\frac{1}{9} \begin{bmatrix} a & 1 & b \\ c & b & 7 \\ 1 & a & c \end{bmatrix}$	5 marks
(b)	Check whether following vectors are linearly dependent? If so find the relation between them $X_1 = [1 \ 2 \ 1]$, $X_2 = [2 \ 1 \ 4]$, $X_3 = [4 \ 5 \ 6]$, $X_4 = [1 \ 8 \ -3]$	5 marks
(c)	Test for consistency the following equations and find solution if consistent $5x_1 - 3x_2 - 7x_3 + x_4 = 10$ $-x_1 + 2x_2 + 6x_3 - 3x_4 = -3$ $x_1 + x_2 + 4x_3 - 5x_4 = 0$	5 marks