WALCHAND COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)
Vishrambag, Sangli – 416415
First Year B.Tech. All Branch
MSE, ODD SEMESTER, AY 2022-23
Engineering Mathematics I (6MA101)

MSE

PRN: _____

ty & Date: Friday, 13/01/2023 Time: 10.30 am to 12.00 noon

Max Marks: **30**

IMP: Verify that you have received question papers with correct course code, branch etc.

Instructions
a) All questions are compulsory.
b) Writing question number on answer book is compulsory otherwise answers may not be assessed.
c) Assume suitable data wherever necessary.
d) Figures to the right of question text indicate full marks.
e) Mobile phones, smart gadgets and programmable calculators are strictly prohibited.
f) Except PRN anything else writing on question paper is not allowed.
g) Exchange/Sharing of stationery, calculator etc. not allowed.

Text on the right of marks indicates course outcomes (Only for faculty use) Marks

1 **A)** Determine the Eigen values and Eigen vectors of the matrix CO1 **6**

$$\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$$

B) Find the rank of the following matrix using Echelon form CO1 **3**

$$\begin{bmatrix} 1 & 3 & 2 & 2 \\ 1 & 2 & 1 & 3 \\ 2 & 4 & 3 & 4 \\ 3 & 7 & 4 & 8 \end{bmatrix}$$

2 **A)** Find the point of curve $y = \log x$ at which the tangent to the curve is parallel to the chord joining the points (1,0), (e,1) CO1 **4**

B) Show that the roots of the equation are $z^4 = i\,(z-1)^4$ are $z = \frac{1}{2} - \frac{1}{2}\cot\left(\frac{\pi+4k\pi}{16}\right)$, $k = 0,1,2,3$ CO2 **6**

C) Apply Cauchy's Mean value theorem to prove that CO2 **5**

$\frac{b-a}{1+b^2} < \tan^{-1} b - \tan^{-1} a < \frac{b-a}{1+a^2}$, $0 < a < b$

3 **A)** Simplify $\left[\frac{1+\sin\left(\frac{\pi}{8}\right)+i\cos\left(\frac{\pi}{8}\right)}{1+\sin\left(\frac{\pi}{8}\right)-i\cos\left(\frac{\pi}{8}\right)}\right]^8$ CO2 **4**

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