H Roll No. .....

TMA–302

B. TECH. (CE) (THIRD SEMESTER)
MID SEMESTER EXAMINATION, 2021
ENGINEERING MATHEMATICS—III

Time : 1½ Hours

Maximum Marks : 50

Note : (i) Answer all the questions by choosing any ***one*** of the sub-questions.

(ii) Each question carries 10 marks.

1. (a) Use the sine inverse formula to find $f(x)$, if : 10 Marks (CO1)

$$f_s^{\wedge}(\lambda) = \frac{\lambda}{1+\lambda^2}$$

OR

(b) Find the Fourier transform of :

10 Marks (CO1)

$$f(x) = \begin{cases} x, & \text{if} \quad |x| \le a \\ 0, & \text{if} \quad |x| > a \end{cases}$$

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2. (a) Find Fourier sine transform of the function : 10 Marks (CO1)

$$f(x) = \begin{cases} x & , \text{ if } 0 < x < 1 \\ 1-x & , \text{ if } 1 < x < 2 \\ 0 & , \text{ if } x > 2 \end{cases}$$

OR

(b) Use Fourier sine transform to solve the equation : 10 Marks (CO1)

$$\frac{\partial u}{\partial t} = 2\frac{\partial^2 u}{\partial x^2}, \quad 0 \le x < \infty$$

under the conditions :

(i) $u(0,t) = 0$

(ii) $u(x,0) = e^{-x}$

(iii) $u(x,t)$

is bounded.

3. (a) Define harmonic conjugate of the given function and find a harmonic conjugate of the function : 10 Marks (CO2)

$$u(x,y) = \frac{1}{2}\log\left(x^2 + y^2\right)$$

OR

(b) Prove that the function $f(z) = z^2$ is analytic everywhere. 10 Marks (CO2)

4. (a) Find an analytic function by using Milne-Thomson method, whose imaginary part is given by $v(x,y) = 2xy$.

10 Marks (CO2)

OR

(b) Evaluate $\int_0^{4+2i}(x - iy)\,dz$ along the curve given by $z = t^2 + it$. 10 Marks (CO2)

5. (a) Using Cauchy's integral formula, evaluate $\int_C \frac{e^{2z}}{(z+1)^4}dz$, where C is circle of radius 3 centered at origin. 10 Marks (CO2)

OR

(b) Using Cauchy integral theorem, evaluate :

$$\int_C \frac{z^2 + 24}{(z-2)(z-3)}dz$$

where C : $|z - 4i| = 3$. 10 Marks (CO2)