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## TMA-301

### B. TECH. (ME) (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) Find an analytic function by using Milne-Thomson method, whose real part is given by  $u(x, y) = x^2 - y^2$ . 10 Marks (CO1)

OR

- (b) Define a harmonic function and prove that the function :

$$u(x, y) = x^2 - y^2 - 2xy - 2x + 3y$$

is harmonic function. 10 Marks (CO1)

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2. (a) Find analytic function whose imaginary part is  $v(x, y) = e^x \cdot \sin y$ .

10 Marks (CO1)

OR

- (b) Prove that the function  $f(z) = z^3$  is analytic everywhere. 10 Marks (CO1)

3. (a) Prove that the function  $f(z) = |z|$  satisfies Cauchy-Riemann equations at origin but not differential therein. 10 Marks (CO1)

OR

- (b) Evaluate : 10 Marks (CO2)

$$\int_0^{4+2i} \{(x dx + y dy) - i(x dy + y dx)\}$$

along the curve given by  $z = t^2 + it$ .

4. (a) Using Cauchy's integral formula, evaluate

$$\int_C \frac{e^{3z}}{(z+1)^3} dz, \text{ where } C \text{ is circle of radius}$$

2 centered at origin. 10 Marks (CO2)

OR

- (b) Using Cauchy integral theorem, evaluate :

10 Marks (CO2)

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

where  $C : |z - 4i| = 3$ .

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5. (a) Evaluate the complex integral  $\int_C z dz$ ,

where  $C$  forms a triangle whose vertices are  $(0, 0)$ ,  $(1, 0)$  and  $(1, 1)$ .

10 Marks (CO2)

OR

- (b) Using Cauchy's integral formula evaluate

$$\int_C \frac{1}{z^3 - 1} dz, \text{ where } C \text{ is the circle}$$

$$|z - 1| = 1.$$

10 Marks (CO2)

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