Roll No. [| | | | | | |] **H**

TMA–310

B. Tech. (ECE) (Third Semester)
Mid Semester EXAMINATION, 2017

ADVANCED ENGINEERING MATHEMATICS

Time : 1:30 Hours] [*Maximum Marks : 50*

Note : (i) This question paper contains two Sections.

(ii) Both Sections are compulsory.

Section—A

1. Write True/False : (1×5=5 Marks)

(a) In C-R equation $\frac{\partial u}{\partial x}=\frac{\partial v}{\partial y}$. (True/False)

(b) If $f(z)=u+iv$, then Harmonic function is $\nabla^2 v=0$. (True/False)

(c) In analytic function $\frac{\partial u}{\partial y}=-\frac{\partial v}{\partial y}$. (True/False)

(d) The order of Laplace equation is one. (True/False)

(e) This is 1D heat equation $\frac{\partial^2 u}{\partial t^2}=\frac{\partial^2 u}{\partial x^2}$. (True/False)

2. Attempt any *five* parts : (3×5=15 Marks)

   (a) Define Differentiability.

   (b) Prove Cauchy-Riemann equation for Polar Co-ordinates.

   (c) Defined Analytic function in complex.

   (d) Define Integral transforms.

   (e) Define Fourier transformation.

   (f) Define application of complex analysis.

Section—B

3. Attempt any *two* parts of choice from (a), (b) and (c). (5×2=10 Marks)

   (a) Evaluate $\oint_C (12z^2 - 4iz)\,dz$ along the curve C joining the point (1, 1) and (2, 3).

   (b) Solve the equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$; $x > 0, t > 0$ under the condition $u = 0$, at $x = 0, t > 0$;

   $$u = \begin{cases} 1 ; & 0 < x < 1 \\ 0 ; & x \geq 1 \end{cases}$$

   when $t = 0$ and $u(x, t)$ is bounded.

   (c) Prove that $u = y^3 - 3x^2 y$ is a harmonic function. Determine its harmonic conjugate.

4. Attempt any *two* parts of choice from (a), (b) and (c). (5×2=10 Marks)

   (a) Find the sine integral representation of :

   $$f(x) = e^{-kx}, \quad x \geq 0$$

   (b) Calculate the values a and b such that the function :

   $$f(x) = x^2 + ay^2 - 2xy + i(bx^2 - y^2 + 2xy)$$

   is analytic.

   (c) Find the cosine integral representation of :

   $$f(x) = \begin{cases} \cos x, & 0 < x < \frac{\pi}{2} \\ 0, & x > \frac{\pi}{2} \end{cases}$$

5. Attempt any *two* parts of choice from (a), (b) and (c). (5×2=10 Marks)

   (a) Express as a Fourier integral representation of the function $f(x)$, where :

   $$f(x) = \begin{cases} 0, & x < 0 \\ 1, & 0 \leq x \leq 1 \\ 0, & x > 1 \end{cases}$$

   (b) State and prove Cauchy-Riemann equation for analytic function.

   (c) Find the Fourier cosine transformation of e^{-x}.