

Printed Pages : 4



EAG201

(Following Paper ID and Roll No. to be filled in your Answer Book)

**PAPER ID : 180213**

Roll No.

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**B. Tech.**

(SEM. II) THEORY EXAMINATION, 2014-15  
ENGINEERING MATHS - II

Time : 3 Hours]

[Total Marks : 100

**Note :** Attempt all questions.**SECTION A****1** Attempt all parts of this question : **10×2=20**

- (a) Find curl of  $\vec{F}$  where  $\vec{F} = xz\hat{i} - y^2\hat{j} + 2x^2y\hat{k}$
- (b) State Gauss divergence theorem.
- (c) Write the Cauchy-Riemann equations.
- (d) Discuss the analyticity of  $f(z) = \bar{z}$ .
- (e) Find  $bn$  if  $f(x) = x^2$  is expanded in Fourier series in  $(-\pi, \pi)$ .

- (f) Write the Fourier series for a function having period  $2\ell$ .
- (g) Solve :  $(D^2 - 2DD' + D'^2)z = 0$
- (h) Find the P.I. of  $(D^2 - D'^2 + D + D')z = e^{x+y}$
- (i) Write the Laplace equation and its solution.
- (j) Find the steady state temperature distribution in a rod of length  $\ell$  whose ends are kept at  $0^\circ\text{C}$  and  $100^\circ\text{C}$  respectively.

## SECTION B

**2** Attempt any three parts of the following : **3×10=30**

- (a) Using Green's theorem, evaluate

$$\int_C [(y - \sin x)dx + \cos x dy]$$

where  $C$  is the

triangle formed by  $y = 0$ ,  $x = \frac{\pi}{2}$ ,  $y = \frac{2}{\pi}x$ .

- (b) Show that the function  $u = x^3 - 3xy^2$  is harmonic and find the corresponding analytic function.
- (c) Find the Fourier series of  $f(x) = \frac{1}{2}(\pi - x)^2$  in  $(0, 2\pi)$ .

- (d) Solve :  $\frac{\partial^2 z}{\partial x^2} - 2\frac{\partial^2 z}{\partial x \partial y} + \frac{\partial^2 z}{\partial y^2} = \sin x$
- (e) Find the temperature distribution in a rod of length  $\ell$  whose ends are kept at zero temperature and initial temperature distribution is  $x$ .

### SECTION C

**Note :** Attempt any one part from each question **5×10=50** of this section.

- 3** (a) Find the divergence and curl of a vector field

$$\vec{f} = x^2 y^2 \hat{i} + 2xy \hat{j} + (y^2 - xy) \hat{k} \text{ at the point}$$

$$(1, -3, 4).$$

- (b) Verify Stoke's theorem for the function

$$\vec{f} = x^2 \hat{i} + xy \hat{j} \text{ integrated round the square}$$

whose sides are  $x=0$ ,  $y=0$ ,  $x=a$ ,  $y=a$  in the plane  $z=0$ .

- 4** (a) Find the values of  $C_1$  and  $C_2$  such that the function

$$f(z) = x^2 + C_1 y^2 - 2xy + i(C_2 x^2 - y^2 + 2xy)$$

- (b) If  $f(z) = u + iv$  is an analytic function, find

$$f(z) \text{ in terms of } z \text{ if } u - v = e^x (\cos y - \sin y).$$

- 5 (a) Find the Fourier series for

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

- (b) Find the half range sine and cosine series for

$$f(x) = x \text{ in } 0 < x < \ell.$$

- 6 (a) Solve :

$$(x^2 - y^2 - yz)p + (x^2 - y^2 - zx)q = z(x - y)$$

- (b) Solve :  $(D^2 - DD')$   $z = \cos x \sin 2y$ .

- 7 (a) Find the deflection  $u(x, t)$  of a string of length 2, whose ends are fixed and the vibration is started by displacing the string

$$\text{into the form } \sin^3 \frac{\pi x}{2}.$$

- (b) Find all the possible solutions of Laplace equations.

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