Printed Pages : 4

EAG201

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

PAPER ID : 180213

Roll No. [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]

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 $\overline{F}$ where $\overline{F} = xz\hat{i} - y^2\hat{j} + 2x^2y\hat{k}$

(b) State Gauss divergence theorem.

(c) Write the Cauchy-Riemann equations.

(d) Discuss the analyticity of $f(z) = \overline{z}$.

(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 2ℓ.

(g) Solve : $\left(D^2 - 2DD' + D'^2\right)z = 0$

(h) Find the P.I. of $\left(D^2 - D'^2 + D + D'\right)z = e^{x+y}$

(i) Write the Laplace equation and its solution.

(j) Find the steady state temperature distribution in a rod of length ℓ whose ends are kept at 0°C and 100°C respectively.

SECTION B

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

(a) Using Green's theorem, evaluate $\int_C \left[(y - \sin x)dx + \cos x dy\right]$ 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 ℓ whose ends are kept at zero temperature and initial temperature distribution is x.

SECTION C

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

3 (a) Find the divergence and curl of a vector field $\overline{f} = x^2 y^2 \hat{i} + 2xy\hat{j} + \left(y^2 - xy\right)\hat{k}$ at the point $(1, -3, 4)$.

(b) Verify Stoke's theorem for the function $\overline{f} = x^2 \hat{i} + xy\hat{j}$ 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

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

(b) If $f(z) = u + iu$ is an analytic function, find $f(z)$ in terms of z 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 $f(x) = x$ in $0 < x < \ell$.

6 (a) Solve :

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

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

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

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