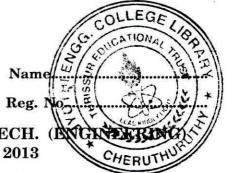
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## COMBINED FIRST AND SECOND SEMESTER B.TECH. DEGREE EXAMINATION, APRIL 2013

PTEN / EN 09 102—ENGINEERING MATHEMATICS-II

(2009 Scheme)

[Regular/Supplementary/ Improvement]

Time: Three Hours

Maximum: 70 Marks

## Part A

Answer all questions.

1. Solve  $ydx - xdy - 3x^2y^2e^{x^3}dx = 0$ .

2. Solve 
$$\frac{d^3y}{dx^3} + \frac{d^2y}{dx^2} - \frac{dy}{dx} - y = 0$$
.

3. Find  $L\left(e^{-3t}\cos 5t\right)$ .

4. Show that  $\overrightarrow{F} = (y^2 - z^2 + 3yz - 2x)\overrightarrow{i} + (3xz + 2xy)\overrightarrow{j} + (3xy - 2xz + 2z)\overrightarrow{k}$  is both solenoidal and irrotational.

5. Define Green's theorem.

 $(5 \times 2 = 10 \text{ marks})$ 

## Part B

Answer any four questions.

6. Solve  $(D^3 - 1) y = x \sin x$ .

7. Solve 
$$(x^2 D^2 + 4xD + 2) y = x^2 + \frac{1}{x^2}$$
.

8. Find L ( $t^2 \cos 3t$ ).

9. Find 
$$L^{-1}\left[\frac{s}{(s+1)(s+2)}\right]$$
.

10. Find the angle between the surfaces  $xy = z^2$  and  $x^2 - y^2 - z^2 = 1$  at the point (6, 4, 3).

11. Use Green's theorem to find the area enclosed by the parabolas  $y^2 = 4ax$  and  $x^2 = 4ay$ .

 $(4 \times 5 = 20 \text{ marks})$ 

Turn over

## Part C

Answer sections (a) and (b).

12. (a) Solve  $(D^4 - 2D^3 + D^2) y = e^x + x^2$ .

Or

- (b) Solve  $\frac{d^2y}{dx^2} + y = x \cos x$  by the method of variation of parameters.
- 13. (a) Using Laplace transform, solve,  $\frac{d^2y}{dt^2} + 4 \frac{dy}{dt} + 13y = 26$  if y(0) = 3 and y'(0) = 4.
  - (b) Using the convolution theorem, find the inverse transform of  $\frac{1}{s(s^2+1)}$ .
- 14. (a) Prove that:
  - (i) Curl grad  $\phi = 0$ .

(ii) Curl 
$$\left( \overrightarrow{curl} \overrightarrow{F} \right) = \nabla \times \left( \nabla \times \overrightarrow{F} \right) = \nabla \left( \nabla . F \right) - \nabla^2 \overrightarrow{F}$$
.

Or

- (b) Prove that  $\overrightarrow{F} = 3yz \overrightarrow{i} + 2zx \overrightarrow{j} + 4xy \overrightarrow{k}$  is not irrotational, but  $(x^2yz^3) \overrightarrow{F}$  is irrotational.
- 15. (a) Verify Green's theorem in a plane, for  $\int_C (3x^2 8y^2) dx + (4y 6xy) dy$ . Where C is the boundary of the region defined by the lines x = 0, y = 0 and x + y = 1.

Or

(b) Verify the divergence theorem, for  $\overrightarrow{F} = x^2 \overrightarrow{i} + z \overrightarrow{j} + yz \overrightarrow{k}$ . Over the cube formed by  $x = \pm 1, y = \pm 1, z = \pm 1$ .

 $(4 \times 10 = 40 \text{ marks})$