

C 80639

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Name.....

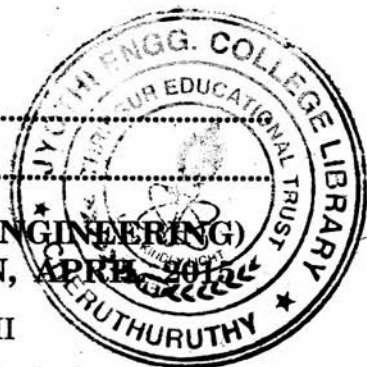
Reg. No.....

COMBINED FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING)  
(09 SCHEME) DEGREE [SUPPLEMENTARY] EXAMINATION, APRIL 2012

PTEN/EN 09 102—ENGINEERING MATHEMATICS – II

Time : Three Hours

Maximum : 70 Marks



**Part A**

Answer all questions.

1. Solve  $(1+y^2)dx = (\tan^{-1} y - x)dy$ .
2. Solve  $\frac{d^3y}{dx^3} - 3\frac{d^2y}{dx^2} + 3\frac{dy}{dx} - y = 0$ .
3. Find  $L(e^{2t} \sin 2t)$ .
4. Prove that  $\vec{F} = (2x + yz)\mathbf{i} + (4y + zx)\mathbf{j} - (6z - xy)\mathbf{k}$  is solenoidal as well as irrotational.
5. State Stoke's theorem.

(5 × 2 = 10 marks)

**Part B**

Answer any four questions.

6. Solve  $(D^2 - 4D + 3)y = e^x \cos 2x$ .
7. Solve  $(D^2 + a^2)y = x \sin ax$ .
8. Find  $L\left(\frac{e^{-at} - e^{-bt}}{t}\right)$ .
9. Find  $L^{-1}\left(\frac{1}{(s+1)(s^2 + 2s + 2)}\right)$ .
10. Find the angle between the surfaces  $x \log z - y^2 = -1$  and  $x^2y + z = 2$  at the point (1, 1, 1).

Turn over

11. Using Green's theorem, evaluate  $\int_C (y - \sin x) dx + \cos x dy$ , where C is the triangle bounded by :

$$y = 0, x = \pi/2, y = \frac{2x}{\pi}.$$

(4 × 5 = 20 marks)

**Part C**

Answer all questions.

12. (a) Using the method of variation of parameters solve  $\frac{d^2 y}{dx^2} + y = x \sin x$ .

Or

(b) Solve  $x \frac{d^2 y}{dx^2} - \frac{2y}{x} = x + \frac{1}{x^2}$ .

13. (a) Using Laplace transforms solve :

$$\frac{d^2 y}{dt^2} + 2 \frac{dy}{dt} + 2y = 5 \sin t, y(0) = 0, y'(0) = 0.$$

Or

- (b) Apply convolution theorem to evaluate the inverse Laplace transform of :

$$\frac{s^2}{(s^2 + a^2)(s^2 + b^2)}.$$

14. (a) Prove that :

(i)  $\text{div}(\text{curl } \bar{F}) = 0$ .

(ii)  $\nabla \cdot (\phi \bar{A}) = \nabla \phi \cdot \bar{A} + \phi \nabla \cdot \bar{A}$ .

Or

- (b) Show that  $\bar{F} = (6xy + z^3)i + (3x^2 - z)j + (3xz^2 - y)k$  is irrotational vector and find the scalar potential function  $\phi$  such that  $\bar{F} = \nabla \phi$ .

15. (a) Verify Gauss divergence theorem for the function  $\vec{F} = 4xi - 2y^2j + z^2k$  over the cylindrical region bounded by  $x^2 + y^2 = 4$ ,  $z = 0$  and  $z = 3$ .

Or

- (b) Verify Stoke's theorem for  $\vec{F} = (x^2 + y^2)i - 2xyj$  taken around the rectangle bounded by the lines  $x = \pm 5, y = 0, y = 3$ .

(4 × 10 = 40 marks)