C 40920 (Pages : 2) Name.........................

Reg. No.........................

COMBINED FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) 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 $y\,dx - x\,dy - 3x^2 y^2 e^{x^3} dx = 0$.

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

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

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

5. Define Green's theorem.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

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

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

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

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

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 × 5 = 20 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 $y'(0) = 4$.

Or

(b) Using the convolution theorem, find the inverse transform of $\frac{1}{s\left(s^2+1\right)}$.

14. (a) Prove that :

(i) Curl grad $\phi = 0$.

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

Or

(b) Prove that $\vec{F} = 3yz\,\vec{i} + 2zx\,\vec{j} + 4xy\,\vec{k}$ is not irrotational, but $(x^2yz^3)\,\vec{F}$ is irrotational.

15. (a) Verify Green's theorem in a plane, for $\int_C \left(3x^2 - 8y^2\right) dx + (4y - 6xy)\, dy$. 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 $\vec{F} = x^2\,\vec{i} + z\,\vec{j} + yz\,\vec{k}$. Over the cube formed by $x = \pm 1, y = \pm 1, z = \pm 1$.

$(4 \times 10 = 40$ marks)