Name.....

Reg. No.....

COMBINED FIRST AND SECOND SEMESTER B.TECH (ENGINEERING) DEGREE EXAMINATION, APRIL 2014

(2009 Scheme)

PTEN / EN 09 102—ENGINEERING MATHEMATICS–II

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*

1. Solve $\frac{dy}{dx} = e^{3x-2y} + x^2 d^{-2y}$.
2. Solve $-y\,dx + \left(x + x^2 y\right) dy = 0$.
3. Find L [$\sin^2 t$].
4. Show that $\nabla \times F = 0$ if $\vec{F} = \left(y^2 + 2xz^2\right)\vec{i} + (2xy - z)\,\vec{j} + \left(2x^2 z - y + 2z\right)\vec{k}$.
5. State Green's theorem.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

6. Solve $(D^4 - 1)\,y = e^x \cos x$.
7. Find the orthogonal trajectories of the family of parabolas $y^2 = 4ax$.
8. Find L [$t \cos at$].
9. Find the inverse Laplace transform of $\frac{s+2}{s^2 - 4s + 13}$.
10. Show that $\nabla^2 f(r) = f''(r) + \frac{2}{r} f'(r)$.
11. Evaluate the line integral $\int_C \left[\left(x^2 + xy\right)dx + \left(x^2 + y^2\right)dy\right]$ where C is the square formed by the lines $y = \pm 1$ and $x = \pm 1$.

(4 × 5 = 20 marks)

Turn over

Part C

Answer **all** *questions.*

12. (a) Solve $(D^2 - 1)y = x \sin 3x + \cos x$.

Or

(b) Solve by the method of variation of parameters $(D^2 + 1)\, y = 2 \cos x$.

13. (a) Solve, using Laplace transforms, $y'' + 4y' + 3y = e^{-t}$, $y(0) = y'(0) = 1$.

Or

(b) Find the inverse Laplace transform of $\frac{s+2}{s^2(s+1)(s+2)}$.

14. (a) If $u = x^2yz, v = xy - 3z^2$, find :

(i) $\nabla(\nabla u \cdot \nabla v)$.

(ii) $\nabla.(\nabla u \times \nabla v)$.

Or

(b) Show that the following vectors are solenoidal :

(i) $(-x^2 + yz)\vec{i} + (4y - z^2x)\vec{j} + (2xz - 4z)\vec{k}$.

(ii) $3y^4x^2\,\vec{i} + 4x^3z^2\,\vec{j} + 3x^2y^2\,\vec{k}$.

15. (a) Verify Green's theorem for $\int_C \left[(xy + y^2)dx + x^2dy\right]$, where C is bounded by $y = x$ and $y = x^2$.

Or

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

($4 \times 10 = 40$ marks)