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Name...

Reg. No...

COMBINED FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) (09 SCHEME) DEGREE [SUPPLEMENTARY] EXAMINATION, APRIL 2015

PTEN/EN 09 102—ENGINEERING MATHEMATICS – II

Time : Three Hours

Maximum : 70 Marks

Part A

Answer **all** *questions.*

1. Solve $\left(1+y^2\right)dx=\left(\tan^{-1}y-x\right)dy.$

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

3. Find $L\left(e^{2t}\sin 2t\right).$

4. Prove that $\overline{F}=(2x+yz)i+(4y+zx)j-(6z-xy)k$ is solenoidal as well as irrotational.

5. State Stoke's theorem.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

6. Solve $\left(D^2-4D+3\right)y=e^x\cos 2x.$

7. Solve $\left(D^2+a^2\right)y=x\sin ax.$

8. Find $L\left(\dfrac{e^{-at}-e^{-bt}}{t}\right).$

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

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 $\frac{d^2y}{dx^2} + y = x \sin x$.

Or

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

13. (a) Using Laplace transforms solve :

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

Or

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

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

14. (a) Prove that :

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

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

Or

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

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

Or

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

(4 × 10 = 40 marks)