

C 26471

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Name.....

Reg. No.....

COMBINED FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING)
DEGREE EXAMINATION, APRIL 2012

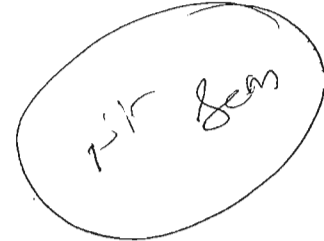
PTEN/EN 09 102—ENGINEERING MATHEMATICS —II

Time : Three Hours

Maximum : 70 Marks

Part A

Answer all questions.



1. Solve $(x^2 - ay) dx = (ax - y^2) dy$

2. Find the Laplace transform of

$$f(t) = k, 0 \leq t \leq a$$
$$= -k, a \leq t \leq 2a$$

and $f(t + 2a) = f(t) \forall t$.

3. Find grad ϕ if $\phi = (y^2 - 2xyz^3) \hat{i} + (3 + 2xy - x^2 z^3) \hat{j} + (6z^3 - 3x^2 y z^2) \hat{k}$.

4. If $\vec{k} = (x^2 + y^2 + 2xz) \vec{i} + (xz - xy + yz) \vec{j} + (z^2 + x^2) \vec{k}$, find $\nabla \cdot \vec{F}$.

5. Evaluate $\int_C \phi d\vec{r}$, where C is the curve $x = t, y = t^2, z = (1 - t)$ and $\phi = x^2 y(1 + z)$ from $t = 0$ to $t = 1$.

(5 × 2 = 10 marks)

Part B

Answer any four questions.

6. Solve $\frac{y}{x} \frac{dy}{dx} + \frac{x^2 + y^2 - 1}{2(x^2 + y^2) + 1} = 0$.

7. Solve $L \left\{ \sin h \frac{t}{2} \sin \frac{\sqrt{3}}{2} t \right\}$.

Turn over

9. Find the angle between the surfaces $x^2 - y^2 - z^2 = 11$ and $xy + yz - zx = 18$ at the point (6, 4, 3).
10. Evaluate $\int_c (x^2 - y^2) dx + 2xydy$ where C is the boundary of the rectangle in the xoy -plane bounded by the lines $x = 0, x = a, y = 0$ and $y = b$.
11. Use Gauss divergence theorem for $\vec{F} = x^2 \vec{i} + y^2 \vec{j} + z^2 \vec{k}$, where S is the surface of the cuboid formed by the planes $x = 0, x = a, y = 0, y = b, z = 0$ and $z = c$ for evaluating $\iiint_S \vec{F} \cdot d\vec{S}$.

(4 × 5 = 20 marks)

Part C

Answer section (a) or section (b) of each question.

12. (a) Solve $(D^2 - 4D + 4)y = 8x^2 e^{2x} \sin x$

Or

(b) Solve the equation $(x^2 + 1) \frac{dy}{dx} + 4xy = \frac{1}{x^2 + 1}$ by using method of variation of parameter.

13. (a) Find the Laplace transform of $\int_0^{\infty} \left(\frac{\cos at - \cos bt}{t} \right) dt$.

Or

(b) Find the inverse Laplace transform of $\frac{s^2 + 8s + 16}{(s^2 + 6s + 10)^2}$.

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

Or

- (b) If u and v are scalar point functions and \vec{F} is a vector point function such that $u\vec{F} = \nabla v$, prove that $\vec{F} \cdot \text{curl } \vec{F} = 0$.

15. (a) If S is a closed surface enclosing a volume V , evaluate $\iint_S \nabla(r^2) \cdot d\vec{S}$

Or

- (b) Use Green's theorem in a plane to find the area of the region in the xy -plane bounded by $y^3 = x^2$ and $y = x$.



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(4 × 10 = 40 marks)