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BOARD DIPLOMA EXAMINATION, (C-23)

OCTOBER/NOVEMBER—2024

THIRD SEMESTER (COMMON) EXAMINATION

ENGINEERING MATHEMATICS – II

Time : 3 Hours]　　　　　　　　　　　　　　　　　　　[*Total Marks* : 80

PART—A　　　　　　　　　　　　　　3×10=30

Instructions : (1) Answer **all** questions.

(2) Each question carries **three** marks.

1. Evaluate : $\int (x^5 + 5^x + 5x)dx$.

2. Evaluate : $\int \left(x - \frac{1}{x} \right)^2 dx$

3. Evaluate : $\int \frac{\cos(\log x)}{x} dx$.

4. Evaluate : $\int e^x (\tan x + \sec^2 x)dx$

5. Evaluate : $\int_0^1 (x^4 + 1)dx$.

6. Evaluate : $\int_{-1}^1 x^5 dx$.

7. Find the area of the region bounded by the curve $y = x^3$, the x- axis between the lines $x = 1$ and $x = 2$.

8. Find the mean value of $f(x) = 3x^2 + 2x$ over the inverval [0, 1].

9. Find the order and degree of the differential equation

$$\frac{d^4y}{dx^4} + 3\frac{d^3y}{dx^3} - \frac{d^2y}{dx^2} - y = 0..$$

10. Find the Fourier coefficient a_0 for $f(x) = k$ in $0 < x < 2\pi$.

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PART—B

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10×5=50

Instructions : (1) Answer *any* **five** questions.

(2) Each question carries **ten** marks.

11. *(a)* Evaluate $\int \frac{1}{x^2 + 2x + 5}\,dx$.

(b) Evaluate $\int \sin 8x \cos 3x\,dx$

12. *(a)* Evaluate $\int \frac{1}{(x+2)(x+3)}\,dx$.

(b) Evaluate $\int x^2 e^{2x}\,dx$.

13. *(a)* Evaluate $\int_0^{\frac{\pi}{2}} \frac{\sin^5 x}{\sin^5 x + \cos^5 x}\,dx$.

(b) Find the R.M.S. value of the function $f(x) = \sqrt{16 - 3x^2}$ over the inverval [0, 1].

14. *(a)* Solve $\frac{dy}{dx} - y \tan x = \sec^3 x$.

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

15. *(a)* Solve $(D^2 - 16)y = 0$.

(b) Solve $(D^2 + 4D + 4)y = 0$.

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16. *(a)* Evaluate $L\{2e^{3t} + \sin 2t + \cos 2t\}$.

(b) Evaluate $L\{t^2 e^{3t}\}$.

17. *(a)* Evaluate $L^{-1}\left\{\dfrac{1}{s} + \dfrac{2}{s^2 + 4} + \dfrac{s}{s^2 + 4}\right\}$.

(b) Evaluate $L^{-1}\left\{\dfrac{s+3}{s^2 + 6s + 13}\right\}$.

18. Find the Fourier series for the function $f(x) = x$ in the interval $[-\pi, \pi]$.

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