C20-EC/CHPC–**401**

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BOARD DIPLOMA EXAMINATION, (C-20)

JUNE/JULY—2022

DECE – FOURTH SEMESTER EXAMINATION

ENGINEERING MATHEMATICS-III

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

PART—A

3×10=30

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

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

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

2. Solve $Y'' + 4Y' + 7Y = 0$

3. Find the particular integral of $\left(2D^2 + D - 6\right)y = e^{-2x}$, where $D \equiv \frac{d}{dx}$.

4. Find the particular integral $\frac{d^2y}{dx^2} + 4y = \sin 2x$.

5. Evaluate $L\left\{\cos^2 t\right\}$

6. Evaluate $L\{g(t)\}$, where $g(t) = \begin{cases} 0 & , \quad 0 < t < \frac{2\pi}{3} \\ \cos\left(t - \frac{2\pi}{3}\right), & t > \frac{2\pi}{3} \end{cases}$

7. Evaluate $L^{-1}\left\{\frac{1}{s^2} - \frac{1}{s-4} + \frac{6}{s^2+4}\right\}$

8. Find the value of a_0 in the Fourier series expansion of $f(x) = x$ in the interval $(0, 2\pi)$.

9. Write the formulae for obtaining the Fourier series of $f(x)$ in the interval $(c, c + 2\pi)$.

10. Find the value of b_n in the Fourier series expansion of $f(x) = x^4$ in the interval $(-1, 1)$.

PART—B

8×5=40

Instructions : (1) Answer **all** questions.
(2) Each question carries **eight** marks.

11. (a) Solve $\frac{d^3y}{dx^3} - 6\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + 36y = 0$

(OR)

(b) Solve $\left(D^4 - 4D^2 + 4\right)y = 0$, where $D \equiv \frac{d}{dx}$.

12. (a) Solve $\left(D^2 - 4D + 4\right)y = 5\cos 3x$, where $D \equiv \frac{d}{dx}$.

(OR)

(b) Solve $\left(D^2 + 1\right)y = x^2 + 3x$, where $D \equiv \frac{d}{dx}$.

13. (a) If $L\{f(t)\} = \frac{1}{s}e^{-\frac{1}{s}}$, then find $L\{e^{-t}f(3t)\}$

(OR)

(b) Using Laplace tranforms, evaluate $\int_0^\infty \left(\frac{e^{-t} - e^{-2t}}{t}\right)dt$.

14. (a) If $L\{\sin\sqrt{t}\} = \frac{\sqrt{\pi}}{2s^{3/2}}e^{-\frac{1}{4s}}$, find $L\left\{\frac{\cos\sqrt{t}}{\sqrt{t}}\right\}$.

(OR)

(b) Evaluate $L\left\{\int_0^t te^t \cos t\, dt\right\}$

15. (a) Evaluate $L^{-1}\left\{\frac{8s+20}{s^2-12s+32}\right\}$

(OR)

(b) Using Convolution theorem, find $L^{-1}\left\{\frac{1}{(s+1)(s+2)}\right\}$.

PART—C

10×1=10

Instructions : (1) Answer the following question.

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

16. Find the half-range Fourier Cosine seris for the function $f(x) = x^2$ in the interval $(0,\pi)$ and hence deduce that $\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \ldots = \frac{\pi^2}{12}$.

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