

7454

BOARD DIPLOMA EXAMINATION, (C-20)

JUNE/JULY—2022

FOURTH SEMESTER COMMON 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  $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + 5y = 0$

2. Solve  $(D^2 + D - 12)y = 0$ , where  $D \equiv \frac{d}{dx}$ .

3. Find the particular integral of  $(D^2 + 4)y = \sin 2x$ , where  $D \equiv \frac{d}{dx}$ .

4. Find the particular integral of  $(D^2 + 5D + 6)y = e^{2x}$ , where  $D \equiv \frac{d}{dx}$ .

5. Evaluate  $L\{e^{-t} + 2\cos 2t + 3t^2\}$

6. Find  $L\{g(t)\}$ , where  $g(t) = \begin{cases} 0, & 0 < t < 4 \\ (t-4)^2, & t > 4 \end{cases}$

7. Evaluate  $L^{-1} \left\{ \frac{s}{(s+2)^2 + 9} \right\}$
8. Find the value of  $a_0$  in the Fourier expansion of  $f(x) = 3x^2$  in the interval  $(-2, 2)$ .
9. Write the Euler's formulae for the Fourier series expansion of  $f(x)$  in the interval  $(0, 2l)$ .
10. Find the value of  $b_n$  in the half-range Fourier sine series of  $f(x) = 1$  in the interval  $(0, \pi)$ .

**PART—B**

8×5=40

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

11. (a) Solve  $\frac{d^3y}{dx^3} + 2\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 8y = 0$

( OR )

(b) Solve  $(D^4 + 2D^2 + 1)y = 0$ , where  $D \equiv \frac{d}{dx}$ .

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

( OR )

(b) Solve  $(D^2 - 6D + 9)y = x^2$ , where  $D \equiv \frac{d}{dx}$ .

13. (a) If  $L\{f(t)\} = \frac{20-4s}{s^2-4s+20}$ , then find  $L\{e^{-t}f(2t)\}$

( OR )

(b) Find  $L\{t^2 \cos 3t\}$

14. (a) Find  $L\left\{\frac{\cos 2t - \cos 3t}{t}\right\}$

( OR )

(b) Find  $L\left\{\int_0^t te^{-t} \sin 4t dt\right\}$

15. (a) Find  $L^{-1}\left\{\frac{s-2}{s^2+5s+6}\right\}$  using partial fractions.

( OR )

(b) Using Convolution theorem, find  $L^{-1}\left\{\frac{1}{s(s^2+4)}\right\}$ .

### PART—C

10×1=10

- Instructions :** (1) Answer the following question.  
 (2) The question carries **ten** marks.

16. Expand the function  $f(x) = x^2$  as a Fourier series in  $(-\pi, \pi)$  and hence

deduce that  $\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots = \frac{\pi^2}{12}$ .