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C20–CHOT-M-401

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

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

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

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

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

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

$10\times1=10$

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