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 $\dfrac{d^2y}{dx^2} - 2\dfrac{dy}{dx} + y = 0$

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

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

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

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

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

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

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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 $\dfrac{d^3y}{dx^3} - 6\dfrac{d^2y}{dx^2} + 2\dfrac{dy}{dx} + 36y = 0$

(OR)

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

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

(OR)

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

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

(OR)

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

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

(OR)

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

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

(OR)

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

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

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