C14–C–401/C14–CM–401/C14–IT–**401**

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BOARD DIPLOMA EXAMINATION, (C–14)

MARCH/APRIL—2017

DCE—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 :

$$\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 4y = 0$$

2. Solve :

$$(D^3 - 5D^2 + 8D - 4)y = 0$$

3. Find the particular integral of $(D^2 - 2D + 1)y = \cosh x$.

4. Find the Laplace transform of $\sin 2t \, \sin 3t$.

5. Find the Laplace transform of $t^3 e^{-3t}$.

6. Find $L^{-1} \left[\dfrac{s^2 - 3s + 4}{s^4} \right]$.

7. Find $L^{-1} \left\{ \dfrac{1}{(s-a)^3} \right\}$.

8. Write down the formulae for finding Euler's constants of Fourier series in the interval $(0, 2\pi)$.

9. Find the value of a_2 in Fourier series expansion of $f(x) = x$ in $(0, 2\pi)$.

10. An urn contains 5 black, 7 red and 3 white balls. A ball is drawn at random. Find the probability that the ball drawn is 'red'.

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PART—B   10×5=50

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

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

11. *(a)* Solve :
$$(D^2 - D - 12)y = e^{2x} + e^{3x}$$

    (b) Solve :
$$(D^2 - 3D + 2)y = \cos 3x$$

12. *(a)* Find the particular integral of $(D^2 - 5D + 6)y = \sin x \sin 4x$.

    (b) Solve :
$$(D^2 - 3D + 2)y = x$$

13. *(a)* Find $L\{(t-2)^2 e^t\}$.

    (b) Find $L\left\{ \dfrac{\cos 2t - \cos 3t}{t} \right\}$.

14. *(a)* Find $L^{-1}\left\{ \log \dfrac{s-3}{s-4} \right\}$.

    (b) Find $L^{-1}\left\{ \dfrac{s-12}{s^2-4s} \right\}$.

15. Expand the function $f(x) = x^2$ as a Fourier series in $(-\pi, \pi)$. Hence show that

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

16. Obtain the Fourier half-range cosine series and sine series for $f(x) = x$ in the interval $(0, \pi)$.

17. *(a)* An integer is chosen at random from the first 200 positive integers. What is the probability that the integer selected is divisible by 6 or 8?

(b) A die is thrown. Let A be the event 'the number appearing is a multiple of 3' and B be the event 'the number appearing is even'. State whether A and B are independent. Support your statement.

18. *(a)* Let A and B be two events with $P(A) = \dfrac{3}{8}$, $P(B) = \dfrac{5}{8}$ and $P(A \cup B) = \dfrac{3}{4}$. Find $P(A|B)$.

(b) Three machines A, B and C produce respectively 60%, 30% and 10% of the total number of items in a factory. The percentages of defective output of these machines are respectively 2%, 3% and 4%. An item is selected at random and is found defective. Find the probability that the item was produced by machine C.

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