



C14-A-401/C14-AA-401/C14-AEI-401/
C14-CH-401/C14-CHST-401/ C14-MET-
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C14-TT-401/C14-BM-401
4401

BOARD DIPLOMA EXAMINATION, (C-14) OCT/

NOV—2016

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 the equation $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} - 5y = 0$.

2. Solve $(D^3 - 3D^2 - 3D - 1)y = 0$.

3. Find the particular integral for $(D^2 - D - 9)y = \sin 3x$.

4. Define Laplace transform of a function $f(t)$ and find $L\{t^3 e^{-3t}\}$.

5. Find the Laplace transform of $\cos 5t \cos 2t$.

6. Find the inverse Laplace transform of $\frac{3s - 14}{(s^2 - 4s - 8)}$.

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7. Write the values of (i) $L^{-1} \frac{d^n}{ds^n} F(s)$, (ii) $L^{-1} \int_s F(s) ds$ and (iii) $L^{-1} \frac{F(s)}{s}$, where $L^{-1}[F(s)] = f(t)$.
8. Find the Fourier coefficient b_n for the function $f(x) = x$ in the interval $[0, 2\pi]$.
9. Write the Fourier cosine series for the function $f(x)$ in the interval $(0, l)$.
10. A box contains 5 black, 7 red and 3 white balls. A ball is drawn at random. Find the probability that the ball drawn is red.

PART—B

10×5=50

Instructions : (1) Answer any **five** questions.
(2) Each question carries **ten** marks.

11. (a) Solve $(D^2 - 14D + 49)y = \sinh 7x$.

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

12. (a) Solve $(D^2 - 4)y = x^4$.

(b) Solve $(D^4 - 2D^2)y = \cos 2x - x$.

13. (a) Find the Laplace transform of $\frac{\sin 3t \cdot \cos t}{t}$.

(b) Evaluate $\int_0^\infty t e^{-3t} \cos t dt$ using the Laplace transforms.

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14. (a) Find $L^{-1} \log \frac{s^2 - 1}{(s - 1)^2}$.

(b) Find $L^{-1} \frac{s}{(s^2 - a^2)^2}$ using convolution theorem.

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15. Find the Fourier series for the function $f(x) = x - x^2$ in $(-1, 1)$.

16. Find the Fourier series expansion for, where

$$f(x) = \begin{cases} x & \text{for } x > 0 \\ x^2 & \text{for } 0 < x \leq \pi \end{cases}$$

and hence deduce $\frac{1}{1^2} - \frac{1}{3^2} + \frac{1}{5^2} - \dots = \frac{\pi^2}{8}$.

17. (a) When two dice are thrown simultaneously, find the probability that the sum is either 7 or 11.

(b) What is the probability that a leap year, selected at random, will have 53 Sundays?

18. (a) Let A and B are two events with $P(A) = \frac{3}{8}$ and $P(B) = \frac{5}{8}$ and $P(A \cap B) = \frac{3}{4}$. Find $P(A \cup B)$, $P(B / A)$ and $P(A / B)$.

(b) A box contains 20 defective items and 80 non-defective items. If two items are selected at random one after the other without replacement, what is the probability that both the items are defective?

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