



C16-A/AA/CH/CHST/C/CM/EC/EE/M/
AEI/MNG/MET/IT/TT/PKG-102

5002

**BOARD DIPLOMA EXAMINATION, (C-16)
MARCH/APRIL—2018
FIRST YEAR (COMMON) EXAMINATION**

ENGINEERING MATHEMATICS—I

Time : 3 hours]

[Total Marks : 80

PART—A

2×15=30

Instructions : (1) Answer *any fifteen* questions.
(2) Each question carries **two** marks.

1. Find the value of $\log_2 16 - 5 \log_2 2$.

2. If

$$\frac{1}{(x-1)(x-2)} = \frac{A}{(x-1)} + \frac{1}{(x-2)}$$

then find A .

3. Write the partial fractions of

$$\frac{x-1}{(x^2-5x-6)}$$

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4. If *

$$A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{pmatrix}, B = \begin{pmatrix} 3 & 4 & 6 \\ 2 & 5 & 1 \end{pmatrix}$$

then find $A^T B$.

5. Define a singular matrix.

6. Find x if

$$\begin{vmatrix} 2 & 5 \\ x & 6 \end{vmatrix} = 2$$

7. If $\tan A = \frac{1}{2}$, $\tan B = \frac{1}{3}$, then find $\tan(A + B)$.

8. Write the formula for $\cos 3\theta$ and $\sin 3\theta$.

9. If $\sin A = \frac{3}{5}$, then find $\sin 2A$.

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10. State sine rule in any triangle ABC .

11. If $z = 3 - 2i$, then find modulus of z .

12. Write the multiplicative inverse of $z = x + iy$.

13. Write the equation of the straight line in intercept form.

14. Find the slope of straight line passing through the points (2, 5) and (4, 3).

15. Find the equation of the point circle with centre at (1, 2).

16. Find the radius of the circle $x^2 + y^2 - 6x - 4y - 12 = 0$.

17. Evaluate

$$\lim_{x \rightarrow 3} \frac{x^3 - 27}{x - 3}$$

18. Evaluate

$$\lim_{x \rightarrow 0} \frac{5^x - 1}{x}$$

19. Write the formula for $\frac{d}{dx}(UV)$.

20. Find $\frac{d}{dx}(e^x \log x)$.

PART—B

10×5=50

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

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

21. (a) Solve $x + y + z = 3$, $2x + 3y + z = 10$, $3x + y + 7z = 1$, using Cramer's rule.

(b) Find the adjoint of

$$A = \begin{pmatrix} 1 & 2 & 4 \\ 1 & 1 & 3 \\ 3 & 2 & 3 \end{pmatrix}$$

22. (a) Show that $\cos A \cos(120^\circ - A) \cos(120^\circ + A) = 0$.

(b) Show that $\sin 20^\circ \sin 40^\circ \sin 80^\circ = \frac{\sqrt{3}}{8}$.

23. (a) ^{*}Show that

$$2 \tan^{-1} \frac{1}{3} = \tan^{-1} \frac{1}{7} + \frac{\pi}{4}$$

(b) Show that

$$\sin^{-1} \frac{4}{5} + \sin^{-1} \frac{5}{13} = \cos^{-1} \frac{16}{65}$$

24. (a) Find the equation of the straight line passing through (3, 4) and perpendicular to $5x + 3y - 1 = 0$.

(b) Find the equation of the circle with (1, 2) and (4, 5) as ends of a diameter.

25. (a) If $x = e^t \cos t$, $y = e^t \sin t$, then find $\frac{dy}{dx}$.

(b) If $y = \sqrt{\sin x + \sqrt{\sin x + \sqrt{\sin x + \dots}}}$, then find $\frac{dy}{dx}$.

26. (a) If $y = \sin^{-1} x$, then show that $(1 - x^2)y'' - xy' = 0$.

(b) Verify that

$$\frac{\partial^2 U}{\partial x \partial y} = \frac{\partial^2 U}{\partial y \partial x}$$

$$\text{if } U = x^3 + y^3 + 3xy.$$

27. Find the lengths of tangent, normal, sub-tangent, sub-normal to the curve $y = x^2 + 2x + 1$ at (1, 4).

28. The sum of two numbers is 48. Find the numbers such that the sum of their squares is minimum.
