



C16-C/CM-102

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BOARD DIPLOMA EXAMINATION, (C-16)
MARCH/APRIL—2018
DCE—FIRST SEMESTER 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 $\log_4 256$.

2. Resolve

$$\frac{1}{x(x-3)}$$

into partial fractions.

3. Define proper fraction with example.

4. Define skew-symmetric matrix.

5. If

$$A = \begin{pmatrix} 0 & 4 \\ 3 & 2 \end{pmatrix} \text{ and } B = \begin{pmatrix} 1 & 0 \\ 3 & 1 \end{pmatrix}$$

then find $2A - 3B$.

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6. If *

$$A = \begin{pmatrix} i & 1 \\ 1 & i \end{pmatrix}$$

then find $\det A$.

7. Solve x , if

$$\begin{vmatrix} 3 & x \\ 2 & 1 \end{vmatrix} = 5$$

8. Define singular matrix.

9. If $\tan A = \frac{1}{2}$ and $\tan B = \frac{1}{3}$, then show that $A + B = 45^\circ$.

10. Prove that $\cos 50^\circ \cos 20^\circ - \sin 50^\circ \sin 20^\circ = \frac{\sqrt{3}}{2}$.

11. If

$$\tan A = \frac{5}{12}$$

then find $\cos 2A$.

12. Prove that

$$\frac{\sin 2A}{1 - \cos 2A} = \cot A$$

13. If $\sin A + \cos A = 1$, then find $\sin 2A$.

14. Prove that

$$\sin 75^\circ - \sin 15^\circ = \frac{1}{\sqrt{2}}$$

15. Prove that

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

16. State cosine rule.

17. Write the formula for projection rule.

18. Write the formula for $\cosh 2x$ and $\sinh 2x$.

19. If $z = 1 - 3i$, then find $z - \bar{z}$.

20. Express

$$\frac{2 - i}{2 + i}$$

in the form of $a + ib$.

PART—B

10×5=50

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

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

21. (a) Resolve

$$\frac{x + 1}{x^2(x - 3)}$$

into partial fractions.

(b) Find the inverse of the matrix

$$\begin{bmatrix} 2 & 1 & 3 \\ 0 & 1 & 1 \\ 1 & 2 & 0 \end{bmatrix}$$

22. (a) Solve the equations :

$$\begin{aligned} x + y + z &= 8 \\ 3x + 5y + 7z &= 14 \\ x + y + 2z &= 6 \end{aligned}$$

by using Cramer's rule.

(b) If

$$A = \begin{bmatrix} 2 & 0 & 1 \\ 2 & 1 & 0 \\ 1 & 1 & 0 \end{bmatrix}$$

then compute $A^2 - 5A + 6I$.

23. (a) ^{*} Prove that

$$\frac{\cos 11^\circ \sin 11^\circ}{\cos 11^\circ \sin 11^\circ} = \cot 34^\circ$$

(b) Show that

$$\cos A \cos(120^\circ - A) \cos(120^\circ + A) = 0$$

24. (a) Prove that

$$\sin 10^\circ \sin 30^\circ \sin 50^\circ \sin 70^\circ = \frac{1}{16}$$

(b) If $\tan A = \frac{b}{a}$, then show that $a \cos 2A = b \sin 2A = a$.

25. (a) If $A + B + C = 180^\circ$, then prove that

$$\sin 2A \sin 2B \sin 2C = 4 \cos A \sin B \cos C$$

(b) If $\sin x = \sin y = a$ and $\cos x = \cos y = b$, then find $\tan(x - y)$.

26. (a) Prove that

$$\cos^2 A \cos^2(60^\circ - A) \cos^2(60^\circ + A) = \frac{3}{2}$$

(b) If $\cos^{-1} x + \cos^{-1} y + \cos^{-1} z = \pi$, then show that

$$x^2 + y^2 + z^2 = 2xyz + 1$$

^{*} 27. (a) Show that

$$\cot^{-1} \frac{4}{3} + \tan^{-1} \frac{5}{12} = \cos^{-1} \frac{63}{65}$$

(b) Solve :

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

28. (a) Express $1 - i\sqrt{3}$ in exponential form.

(b) Find the complex conjugate and multiplicative inverse of $(2 - 3i)(1 - 2i)$.
