



C16-EC-102

5141

BOARD DIPLOMA EXAMINATION, (C-16)

MARCH/APRIL—2018

DECE—FIRST SEMESTER EXAMINATION

ENGINEERING MATHEMATICS (COMMON-102)

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  $\log_{25} 5$ .

2. Define a proper fraction.

3. If  $\frac{1}{(x-5)(x-7)} = \frac{k}{x-5} + \frac{1}{x-7}$ , then find the value of  $k$ .

4. Define a scalar matrix.

5. If  $A = \begin{bmatrix} 9 & 1 \\ 4 & 3 \end{bmatrix}$ ,  $B = \begin{bmatrix} 1 & 5 \\ 6 & 7 \end{bmatrix}$ , find  $(A+B)$  and  $(A-B)$ .

6. If  $A = \begin{bmatrix} 4 & 2 \\ 1 & 1 \end{bmatrix}$ , find  $A^2$ .

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**7.** If  $A = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 5 & 6 \\ 3 & x & 7 \end{pmatrix}$  is a symmetric matrix, find the value of  $x$ .

**8.** Find  $\begin{vmatrix} \cos & \sin \\ \sin & \cos \end{vmatrix}$ .

**9.** Write the formula for  $\tan(A \pm B)$ .

**10.** Show that  $\cos^2 15^\circ - \cos^2 75^\circ = \sqrt{3}/2$ .

**11.** Write the formulae for  $\sin 3A$  and  $\cos 3A$ .

**12.** If  $\tan A = 2$ , then find the value of  $\cos 2A$ .

**13.** Prove that  $\frac{\sin 2A}{1 - \cos 2A} = \cot A$ .

**14.** Prove that  $\sin 78^\circ - \sin 18^\circ - \cos 132^\circ = 0$ .

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**15.** If  $\sin^{-1}(3/5) = A$ , then find  $\cos A$ ?

**16.** State the sine rule.

**17.** State the projection rule.

**18.** Define  $\sinh x$  and  $\cosh x$ .

**19.** Find  $Z + \bar{Z}$ , if  $Z = 2 + 3i$ .

**20.** Find the modulus of  $\frac{3 + 4i}{1 - 7i}$ .

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**PART—B**

10×5=50

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

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

**21.** (a) Resolve  $\frac{1}{(x^2 - 1)(x^2 - 2)}$  into partial fractions.

(b) If  $A = \begin{pmatrix} 2 & 4 \\ 5 & 3 \end{pmatrix}$ ,  $B = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ , then prove that  $(A + B)^T = A^T + B^T$ .

**22.** (a) Prove that

$$\begin{vmatrix} b & c & a & a \\ b & c & a & b \\ c & c & a & b \end{vmatrix} = 4abc$$

(b) Find the adjoint of the matrix

$$\begin{pmatrix} 1 & 0 & 2 \\ 3 & 4 & 5 \\ 2 & 3 & 1 \end{pmatrix}$$

**23.** (a) Solve the following equations using Cramer's rule

$$\begin{matrix} x & y & z & 3 \\ x & 2y & 3z & 4 \\ x & 4y & 9z & 6 \end{matrix}$$

(b) If  $w$  is cube root of unity, prove that

$$\begin{vmatrix} 1 & w & w^2 \\ w & w^2 & 1 \\ w^2 & 1 & w \end{vmatrix} = 0$$

24. (a) <sup>\*</sup> Prove that

$$\frac{\cos 37^\circ - \sin 37^\circ}{\cos 37^\circ + \sin 37^\circ} = \cot 8^\circ$$

(b) Prove that

$$\tan 3A \tan 2A \tan A = \tan A \tan 2A \tan 3A$$

25. (a) In a triangle  $ABC$ , prove that

$$\cos 2A \cos 2B \cos 2C = 1 - 4 \sin A \sin B \cos C$$

(b) If  $\cos x = \cos y = \frac{1}{3}$  and  $\sin x = \sin y = \frac{1}{4}$ , find  $\tan \frac{x-y}{2}$ .

26. (a) Prove that  $\cos 10^\circ \cos 50^\circ \cos 70^\circ = \frac{\sqrt{3}}{8}$ .

(b) Prove that

$$\tan^{-1} \frac{1}{5} + \tan^{-1} \frac{1}{7} = \cot^{-1} \frac{17}{6}$$

27. (a) If  $\sin^{-1} x + \sin^{-1} y + \sin^{-1} z = \frac{\pi}{2}$ , show that

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

(b) ST

$$\sin^{-1} \frac{3}{5} + \sin^{-1} \frac{5}{13} = \cos^{-1} \frac{33}{65}$$

28. (a) Find the real and imaginary parts of  $\frac{4-2i}{1+2i}$ . The lines  $x=2$ ,  $x=3$  about the  $x$ -axis.

(b) Express the complex number  $(\sqrt{3}-i)$  in modulus-amplitude form.

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