# 5102

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

ENGINEERING MATHEMATICS—I

*Time* : 3 hours ]　　　　　　　　　　　　　　[ *Total Marks* : 80

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**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

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

into partial fractions.

3. Write the types of fractions.

4. If

$$A = \begin{bmatrix} 2 & 3 \\ 4 & 7 \end{bmatrix} \text{ and } B = \begin{bmatrix} 1 & 0 \\ 2 & 4 \end{bmatrix} \text{ find } A-B.$$

**5.** If

$$A = \begin{bmatrix} i & 0 \\ 0 & i \end{bmatrix}$$

Find $A^2$.

**6.** Define skew symmetric matrix.

**7.** Find the value of

$$\begin{vmatrix} \sin & \cos \\ \cos & \sin \end{vmatrix}$$

**8.** If

$$\begin{vmatrix} 2 & 1 \\ 3 & x \end{vmatrix} = 1 \text{ , find } x$$

**9.** Write the formula for $\sin(A \quad B)$ and $\cos(A \quad B)$.

**10.** Find the value of $\sin 15^\circ$.

**11.** Write the formula for $\sin 2A$ and $\cos(A \quad B)$.

**12.** Find the value of $4\cos^3 20^\circ \quad 3\cos 20^\circ$.

**13.** Find $\sin 2A$, if $\sin A \quad \dfrac{4}{5}$, $A$ is acute.

**14.** Express $\cos(2x \quad 3y) \quad \cos(3x \quad 2y)$ as product.

**15.** Write the formula for $\tan^{-1} x \quad \tan^{-1} y$.

**16.** State sine rule.

**17.** State projection rule.

**18.** Write any two hyperbolic functions.

**19.** Express

$$\frac{1+i}{1-i}$$

in the form $a+ib$.

**20.** Find the additive inverse of $4+3i$.

<div align="center"><b>PART—B</b></div> <div align="right">10×5=50</div>

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

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

**21.** *(a)* Resolve

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

into partial fractions.

*(b)* Find the adjoint of the matrix

$$\begin{matrix} 1 & 2 & 1 \\ 3 & 2 & 2 \\ 1 & 1 & 2 \end{matrix}$$

**22.** *(a)* Solve the equations

$$x+2y+x = 3$$
$$3x+y+z = 4$$
$$x+y+2z = 6$$

using Cramer's rule.

*(b)* Prove that

$$\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ b+c & c+a & a+b \end{vmatrix} = 0$$

**23.** *(a)* Show that

$$\frac{\cos 11° + \sin 11°}{\cos 11° - \sin 11°} = \tan 56° \ \text{(or)} \ \cot 34°$$

*(b)* If $A + B = 45°$

show that $(1 + \tan A)(1 + \tan B) = 2$

**24.** *(a)* Prove that

$$\sin A \sin(60° - A) \sin(60° + A) = \frac{1}{4}\sin 3A$$

*(b)* Prove that

$$\tan\left(\frac{\pi}{4} + \theta\right) - \tan\left(\frac{\pi}{4} - \theta\right) = 2\tan 2\theta$$

**25.** *(a)* Prove that

$$\frac{\sin A + \sin 2A + \sin 3A + \sin 4A}{\cos A + \cos 2A + \cos 3A + \cos 4A} = \cot A$$

*(b)* Prove that

$$\cos A + \cos(120° - A) + \cos(120° + A) = 0$$

**26.** *(a)* In any triangle $ABC$, prove that

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

*(b)* Prove that

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

**27.** *(a)* Prove that

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

*(b)* If

$$\tan^{-1}x + \tan^{-1}y + \tan^{-1}z = \pi$$

prove that $x + y + z = xyz$.

**28.** *(a)* Find the real and imaginary parts of

$$\frac{3 + 2i}{7 - 4i}$$

*(b)* Find the modulus and amplitude of $4 + 3i$.

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