



C16-M-102

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BOARD DIPLOMA EXAMINATION, (C-16)  
MARCH/APRIL—2018  
DME—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  $\log_5 625$ .

2. Define proper fraction and give one example.

3. If  $\frac{3x}{(x-2)(x-1)} = \frac{2}{x-2} + \frac{A}{x-1}$ , then find the value of A.

4. Define symmetric matrix and give one example.

5. If  $A = \begin{pmatrix} 2 & 3 \\ 4 & 5 \end{pmatrix}$  and  $B = \begin{pmatrix} 3 & 0 \\ 3 & 5 \end{pmatrix}$ , then find  $(A+B)$  and  $(A-B)$ .

6. If  $A = \begin{pmatrix} 1 & 4 \\ 8 & 2 \end{pmatrix}$ , then find  $A^2$ .

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7. If  $A = \begin{pmatrix} 5 & 4 \\ x & 4 \end{pmatrix}$  is singular matrix, then find  $x$ .

8. Find the value of  $\begin{vmatrix} 2 & 4 \\ 4 & 9 \end{vmatrix}$ .

9. Show that  $\tan(45^\circ - A)\tan(45^\circ + A) = 1$ .

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

11. If  $\sin \theta = \frac{4}{5}$ , then find the value of  $\sin 2\theta$ .

12. Show that  $\cot^2 \theta = \csc^2 \theta - 1$ .

13. If  $A = 15^\circ$ , then find  $\tan 3A = \cot 3A$ .

14. Convert  $\cos 130^\circ = \cos 30^\circ$  into product.

15. Prove that  $\cos^{-1} \frac{4}{5} = \sin^{-1} \frac{3}{5}$ .

16. State sine rule.

17. State projection rule.

18. Write the identity of hyperbolic function.

19. Express  $\frac{2 - 5i}{4 + 3i}$  in the form of  $(a + ib)$ .

20. If  $z = 2 - 3i$ , then find  $z + \bar{z}$ .

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**PART—B**

10×5=50

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

**21.** (a) Resolve  $\frac{(x-1)}{(x-2)(x-3)}$  into partial fractions.

(b) If

$$A = \begin{vmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{vmatrix}$$

then show that  $A^2 = 4A + 5I - 0$  where  $I$  is  $3 \times 3$  unit matrix.

**22.** (a) Prove that

$$\begin{vmatrix} a & b & 2c & a & b \\ & c & b & c & 2a & b \\ & c & & a & c & a & 2b \end{vmatrix} = 2(a-b-c)^3$$

(b) Solve the following equation by Cramer's method :

$$x + y + z = 9; 2x + 5y + 7z = 52; 2x + y + z = 0$$

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**23.** (a) Prove that

$$\frac{\cos 11^\circ \sin 11^\circ}{\cos 11^\circ \sin 11^\circ} = \tan 56^\circ$$

(b) Prove that  $\cos A + \cos(120^\circ + A) + \cos(120^\circ - A) = 0$ .

**24.** (a) Show that

$$\frac{\tan 2^\circ}{1 - \sec 2^\circ} = \tan$$

(b) Prove that  $\cos 20^\circ \cos 40^\circ \cos 60^\circ \cos 80^\circ = \frac{1}{16}$ .

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

$$\frac{\sin 8A}{\cos 8A} - \frac{\sin 6A}{\cos 6A} = \tan 7A$$

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

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

26. (a) If  $\cos x = \frac{3}{5}$  and  $\cos y = \frac{2}{7}$ , show that

$$21 \tan \frac{x+y}{2} - 10 \cot \frac{x-y}{2} = 0$$

(b) Show that

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

27. (a) Show that

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

(b) If

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

then show that  $x + y + z = xyz$ .

28. (a) Find the additive and multiplicative inverse of

$$\frac{9}{2 - \sqrt{5}i}$$

(b) Express  $(3 - 4i)$  in the modulus-amplitude form.

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