1209

Code : 15SC-01M

Register Number | | | | | | | |

I Semester Diploma Examination, April/May-2017

ENGINEERING MATHEMATICS – I

Time : 3 Hours] **[Max. Marks : 100**

Note : (i) Answer any **ten** questions from Section – **A**, any **eight** questions from Section – **B** and any **five** questions from Section – **C**.

(ii) Each question carries **3** marks in Section – **A**.

(iii) Each question carries **5** marks in Section – **B**.

(iv) Each question carries **6** marks in Section – **C**.

SECTION – A

1. Given $A = \begin{bmatrix} 2 & 3 \\ 4 & -1 \end{bmatrix}$, $B = \begin{bmatrix} 3 & 0 \\ -1 & -3 \end{bmatrix}$, find $3B - 2A$. **3**

2. If $A = \begin{bmatrix} 2 & -1 \\ 3 & 4 \end{bmatrix}$, find the matrix A^2. **3**

3. Find the inverse of the matrix $A = \begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix}$. **3**

4. If $\vec{a} = i + 2j + 3k$, and $\vec{b} = 4i - j - 5k$, find $\vec{a} + \vec{b}$ and $|\vec{a} + \vec{b}|$. **3**

5. If $\vec{a} = 2i - j + k$, and $\vec{b} = 3i + j - k$, find $\vec{a} \cdot \vec{b}$. **3**

6. A coin is tossed twice, what is the probability that atleast one head occurs ? **3**

7. If $\sin\theta = \frac{5}{13}$, $\frac{\pi}{2} < \theta > \pi$, find the value of $\cos\theta + \tan\theta$. **3**

8. Find the value of $\cos 15°$. **3**

9. Show that :

   $\tan 5A - \tan 3A - \tan 2A = \tan 5A \cdot \tan 3A \cdot \tan 2A$. **3**

10. Show that $(\sin\theta + \cos\theta)^2 = 1 + \sin 2\theta$. **3**

11. Prove that $\frac{1 + \cos 2x}{\sin 2x} = \cot x$. **3**

12. Evaluate i^{+9} and i^{-9}. **3**

13. Evaluate $\lim_{x \to 1} \frac{x^2 - 2x + 3}{x^2 + x + 1}$. **3**

14. Evaluate $\lim_{x \to 0} \frac{\sin px}{\tan qx}$. **3**

SECTION – B

15. Solve the equations for x & y by Cramer's rule $5x - 3y = 1$, and $2x - 5y = -11$. **5**

16. If $A = \begin{bmatrix} -1 & 0 \\ 5 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 5 \\ 2 & 4 \end{bmatrix}$, then prove that adj. (AB) = (adj. (B)) . (adj(A)). **5**

17. Find cosine of the angle between the two vectors $\vec{a} = 4i - 2j - 3k$ and $\vec{b} = 2i - 3j + 4k$. **5**

18. If the vertices of a triangle have position vectors $4i + 5j + 6k$, $5i + 6j + 4k$ and $6i + 4j + 5k$, then prove that triangle is an equilateral triangle. **5**

19. If $\vec{a} = i + j + 2k$ and $\vec{b} = 2i - j + k$, then show that $(\vec{a} + \vec{b})$ is perpendicular to $(\vec{a} - \vec{b})$. **5**

20. If $x = \log_a bc$, $y = \log_b ca$, $z = \log_c ab$, then prove that $\frac{1}{1+x} + \frac{1}{1+y} + \frac{1}{1+z} = 1$. **5**

21. Find the numerical value without using trigonometric table/calculator **5**

$\sin 120° \cdot \cos 330° - \sin 240° \cdot \cos 390°$.

22. Prove that $\frac{\cos 17° + \sin 17°}{\cos 17° - \sin 17°} = \tan 62°$. **5**

23. If $\cos \alpha = \frac{3}{5}$ and $\cos \beta = \frac{5}{13}$, find the value of $\sin (\alpha + \beta)$. **5**

24. Prove that $\frac{1 + \sin 2A + \cos 2A}{1 + \sin 2A - \cos 2A} = \tan (90° - A)$. **5**

25. Evaluate $\lim_{x \to 0} \frac{\sin 4x - \sin 2x}{\sin 6x + \sin 2x}$. **5**

SECTION – C

26. Solve for x, y, z using determinants method, $x + y = 9$, $x - y + 3z = 2$, $4y - 3z - 5 = 0$. **6**

27. Verify Cayley-Hamilton theorem for the matrix $A = \begin{bmatrix} 3 & 2 \\ 4 & 5 \end{bmatrix}$. **6**

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28. If A (2, 5, 7), B (3, 9, 4), C (–2, 5, 7) are three vertices of parallelogram, then find its area. **6**

29. A pair of dice is thrown once. If the two numbers appearing are different, find the probability that sum of numbers is 6. **6**

30. If $\tan \alpha = 4/3$ and α is acute, then find the value of $\frac{2 \sin \alpha - 3 \cos \alpha}{3 \sin \alpha + \cos \alpha}$. **6**

31. In a triangle ABC, prove that $\sin 2A + \sin 2B + \sin 2C = 4 \sin A \cdot \sin B \cdot \sin C$. **6**

32. Express $-\sqrt{3} - i$, in polar form. **6**

33. Evaluate $\lim_{x \to -3} \frac{x^2 + 4x + 3}{x^2 + 5x + 6}$ **6**