1454

Code : 15SC01M

Register Number | | | | | | | |

I Semester Diploma Examination, April/May-2018

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. If $A = \begin{bmatrix} 5 & -2 \\ -7 & 1 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 1 \\ -1 & 4 \end{bmatrix}$. Find A + B.

2. If $A = \begin{bmatrix} 2 & -1 \\ 3 & 4 \end{bmatrix}$. Find A^2.

3. If $A = \begin{bmatrix} 3 & 2 \\ 4 & 5 \end{bmatrix}$. Find characteristic equation.

4. If $\vec{a} = 2i + 5j - 6k$, $\vec{b} = 5i - j + 2k$. Find $\vec{a} \cdot \vec{b}$.

5. Find Unit vector in the direction of $\vec{a} = 5i - j + 2k$.

6. A die is thrown once, what is the probability of an odd number appears ?

7. If $\sin\theta = \frac{3}{5}$, 'θ' is acute angle find $\cos\theta + \tan\theta$.

8. Find the value of $\sin\frac{5\pi}{6} + \cos\frac{5\pi}{6}$.

[Turn over

9. Prove that $\tan\left(\frac{\pi}{4}+\theta\right)=\frac{1+\tan\theta}{1-\tan\theta}$.

10. Prove that $(\cos\theta + \sin\theta)^2 = 1 + \sin 2\theta$.

11. Prove that $\cos 100° + \cos 80° = 0$

12. Find the real and imaginary part of $(2 - 3i)$.

13. Evaluate $\lim_{x\to 3}\frac{x^3-27}{x-3}$.

14. Evaluate $\lim_{\theta\to 0}\frac{\tan m\theta}{\tan n\theta}$.

SECTION – B

15. Solve the equations $x + y = 3$, $2x + 3y = 8$ by determinant method.

16. Verify Cayley-Hamilton theorem for the matrix.

$$A=\begin{bmatrix}2 & -1\\ 3 & 2\end{bmatrix}$$

17. If $\vec{a} = 3i - j + \lambda k$, $\vec{b} = -3i + 3j - 4k$ are orthogonal, find the value of λ.

18. Find the unit vector perpendicular to both vectors $\vec{a} = i + j + k$, $\vec{b} = 2i - 3j + 2k$.

19. Find the workdone by the force $\vec{F} = 5i + 3j + 7k$ in moving a particle from the point A(1, 2, –1) to B(3, 1, –4).

20. Prove that $\log_y x^3 \times \log_z y^4 \times \log_x z^5 = 60$.

21. Prove that

$$\frac{\operatorname{cosec}(180^\circ-\theta)\cdot\cos(-\theta)}{\sec(180^\circ+\theta)\cdot\cos(90^\circ+\theta)}=\cot^2\theta.$$

22. Prove that $\frac{\sin 2A}{\sin A}-\frac{\cos 2A}{\cos A}=\sec A$.

23. If $A+B+C=\frac{\pi}{2}$, prove that

$$\tan A\cdot\tan B+\tan B\cdot\tan C+\tan C\cdot\tan A=1.$$

24. Prove that

$$\frac{\sin 5A+\sin 3A}{\sin 5A-\sin 3A}=\tan 4A\cdot\cot A.$$

25. Evaluate $\lim_{x\to 2}\frac{x^2-9x+14}{x^2-4}$.

SECTION – C

26. Find the value of x, if the $\begin{vmatrix} 2 & 3 & 4 \\ -4 & x & -8 \\ 5 & 6 & 7 \end{vmatrix}=0$.

27. If $A=\begin{bmatrix} 6 & 3 \\ 6 & 5 \end{bmatrix}$, find $A(\text{adj}\cdot A)$.

28. If $\vec{a}=3i+2j-4k$ and $\vec{b}=i-2j+5k$ are two sides of a triangle, find its area.

29. A family has two children. What is the probability that both are boys given that youngest is a boy ?

30. If $\tan\theta=\frac{4}{3}$ and 'θ' is acute angle,

Find value of $\frac{2\sin\theta-3\cos\theta}{3\sin\theta+\cos\theta}$.

31. Prove that

$$\sin 20° \cdot \sin 40° \cdot \sin 80° = \frac{\sqrt{3}}{8}.$$

32. Express $1 + \sqrt{3}i$ is in a polar form and find the modulus and amplitude.

33. Prove that

$$\lim_{\theta \to 0} \frac{\sin \theta}{\theta} = 1 \text{ where}$$

'θ' is in radian.
