1146

Code : 15SC01M

Register Number

I Semester Diploma Examination, April/May-2019

ENGINEERING MATHEMATICS - I

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

Instructions : (i) Answer any **10** questions from Section – **A**. Each question carries **3** marks.

(ii) Answer any **8** questions from Section – **B**. Each question carries **5** marks.

(iii) Answer any **5** questions from Section – **C**. Each question carries **6** marks.

SECTION – A

(Answer any **ten**)

1. If $A = \begin{bmatrix} 4 & 6 \\ 1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 3 \\ 1 & 1 \end{bmatrix}$, find $A + 2B$. **3**

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

3. If the matrix $A = \begin{bmatrix} 2 & -2 \\ 4 & 1 \end{bmatrix}$, find $A(\text{Adj} \cdot A)$. **3**

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

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

6. A coin is tossed twice. What is the probability that at least one head occurs ? **3**

[Turn over

7. Find the value of $\sin(270° - \theta) \cdot \cos(180° - \theta)$. 3

8. Find the value of $\sec(-810°) + \cos 0°$. 3

9. Prove that, $\sin 2A = 2\sin A \cos A$. 3

10. Prove that $\tan(45° + \theta) = \frac{1 + \tan\theta}{1 - \tan\theta}$ 3

11. Prove that $\cos 40° + \cos 50° = \sqrt{2}\cos 5°$. 3

12. Find the real and imaginary part of $[2 + i]^2$. 3

13. Evaluate $\lim_{x \to \infty} \frac{2x^2 + 3x + 5}{6x^2 - 5x + 2}$. 3

14. Evaluate $\lim_{\theta \to 0} \frac{\tan 2\theta}{\theta}$ 3

SECTION – B

(Answer any **eight**)

15. Solve the equations $4x - 2y = 2$, $3x + y = 14$ by using Cramer's rule. 5

16. Verify Cayley-Hamilton theorem if $A = \begin{bmatrix} 4 & -2 \\ 5 & 3 \end{bmatrix}$. 5

17. Show that the position vectors of the points $2i + 3j + 5k$, $3i + 5j + 2k$ and $5i + 2j + 3k$ form an equilateral triangle. 5

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

12. The following set of processes with the length of the CPU burst time given in milliseconds. 10

Process	Burst time	Priority
P_1	10	3
P_2	13	1
P_3	3	3
P_4	8	4

The processes are assumed to have arrived in the order P_1, P_2, P_3 and P_4.

(a) Draw the Gantt chart for FCFS and PRIORITY scheduling algorithm.

(b) Calculate the waiting time and turn around time of each process for FCFS and PRIORITY scheduling algorithm.

(c) Calculate the Average waiting time and Average turn around time for FCFS and PRIORITY scheduling algorithm.

13. Explain Resource-Allocation graph with deadlock and without deadlock. 10

14. (a) Explain swapping techniques with neat diagram. 5

(b) Define Fragmentation. Differentiate between internal and external fragmentation. 5

15. Explain the implementation of memory allocation using paging. 10

16. Explain the steps involved in the basic page replacement with diagram. 10

17. Consider the following reference string : 10

7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1

How many page faults would occur for the following page replacement algorithms assuming 3 page frames :

(1) LRU

(2) FIFO

(3) Optimal Page Replacement

18. List out common file types with their extensions and functions. 10

19. Explain Single-level directory and two-level directory with a neat diagram. 10

19. Find the unit vector perpendicular to both vectors : 5

$\vec{a} = 2i + j + 3k$ and $\vec{b} = i + 2j - k$

20. Show that : 5

$\log_2 2 - \log_4 2 + \log_8 2 - \log_{16} 2 = \frac{7}{12}$

21. Prove that : 5

$$\frac{\sin(-\theta)\tan(\frac{\pi}{2}-\theta)\cos(3\frac{\pi}{2}+\theta)}{\sin(\pi-\theta)\cdot\cot(\pi-\theta)\cdot\sin(3\frac{\pi}{2}-\theta)} = -\tan\theta$$

22. If $\sin A = \frac{1}{\sqrt{10}}$, $\sin B = \frac{1}{\sqrt{5}}$, find the value of $\sin(A + B)$. 5

23. Prove that :

$\cos 3A = 4\cos^3 A - 3\cos A$ 5

24. Prove that :

$\sin 10° \cdot \sin 50° \cdot \sin 70° = \frac{1}{8}$ 5

25. Evaluate :

$$\lim_{x \to 0} \frac{3x + \tan 2x}{\sin 3x - 5x^2}$$ 5

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SECTION – C

(Answer any **five** questions)

26. Solve for x and y using determinant method $x + y + z = 0$, $2x + 5y - 9 = 0$ & $4y - 7z + 19 = 0$.

27. Find the inverse of the matrix $A = \begin{bmatrix} 2 & -1 & 3 \\ 1 & 0 & -2 \\ 3 & 4 & 5 \end{bmatrix}$.

28. Find the moment of force $\vec{F} = i + 2j + 3k$, acting at a point $2i - j + 2k$ and about the point $3i + 2j + k$.

29. A dice is thrown once. Find the probability of getting :

    (i) a prime number

    (ii) a number greater than 4.

30. Find the value of : $2\sin^2\frac{2\pi}{3} + 3\cos^2\frac{3\pi}{4} - 4\tan^2\frac{5\pi}{4} + 3\cot^2\frac{4\pi}{3}$

31. If A, B, C are the angles of triangle, then prove that $\sin 2A + \sin 2B + \sin 2C = 4 \sin A \sin B \sin C$.

32. Express the complex number $2 + 2\sqrt{3}\,i$, in the polar form.

33. Evaluate : $\lim_{x \to 0} \frac{\sqrt{1+3x} - \sqrt{1-3x}}{x}$.