2613

Code : 15SC01M

Register Number | | | | | | | |

I Semester Diploma Examination, Nov./Dec. 2015

ENGINEERING MATHEMATICS-I

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

Note : (i) Answer any **10** questions from Section-A. Each carries **3** marks.
(ii) Answer any **8** questions from Section-B. Each carries **5** marks.
(iii) Answer any **5** questions from Section-C. Each carries **6** marks.

SECTION – A

Answer any **10** questions.

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

2. If $A = \begin{bmatrix} 2 & -1 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 5 & -2 \\ 3 & 1 \\ 2 & 4 \end{bmatrix}$, find AB matrix. **3**

3. If $A = \begin{bmatrix} 3 & -2 \\ 2 & -1 \end{bmatrix}$, find its characteristic equation. **3**

4. Find the magnitude of vector $i + 2j + k$. **3**

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

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

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

8. Find the value of $\cos 75°$. **3**

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9. Prove that $\frac{\sin 2A}{\sin A} - \frac{\cos 2A}{\cos A} = \sin A$. 3

10. If $A + B + C = 180°$, Prove that $\cot\left(\frac{A+B}{2}\right) = \tan\frac{C}{2}$. 3

11. Prove that $\cos 100° + \cos 80° = 0$. 3

12. Find the real and imaginary part of $\frac{1}{\sqrt{2}+2}$. 3

13. Find $\lim_{x \to 2} \frac{x^4 - 16}{x - 2}$. 3

14. Evaluate $\lim_{x \to 0} \frac{1 - \cos 2x}{x^2}$. 3

SECTION – B

Answer any **8** questions.

1. Solve for x using determinants.
   $x + y = 9$, $x - y + 3z = 2$ and $4y - 3z - 5 = 0$. 5

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

3. Find the cosine of the angle between the vectors $4i - 2j - 3k$ and $2i - 3j + 4k$. 5

4. Find the projection of $\vec{a} = i + 2j + k$ on $\vec{b} = 2i - 3j + k$. 5

5. Find the area of Parallelogram, whose adjacent sides are $3i + 2j - k$ and $i + 2j + 3k$. 5

6. If $\log\left(\frac{a+b}{3}\right) = \frac{1}{2}(\log a + \log b)$, show that $a^2 + b^2 = 7ab$. 5

7. Prove that : $\sin^2\frac{\pi}{4} + \sin^2\frac{3\pi}{4} + \sin^2\frac{5\pi}{4} + \sin^2\frac{7\pi}{4} = 2$ 5

8. Prove that cos (A + B) = cosA cosB – sinA sinB geometrically. 5

9. If $A + B = \frac{\pi}{4}$, prove that (1 + tan A) (1 + tan B) = 2. 5

10. If A + B + C = π, prove that tan 2A + tan 2B + tan 2C = tan 2A tan 2B tan 2C. 5

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

SECTION – C

Answer any **5** questions.

1. If $\begin{vmatrix} 2 & m-1 & -3 \\ 1 & -2 & 4 \\ 3 & -1 & 5 \end{vmatrix} = 3m - 1$, find the value of m. 6

2. If $A = \begin{bmatrix} -1 & 0 \\ 5 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 5 \\ 2 & 4 \end{bmatrix}$, prove that adj (AB) = (adj B) (adj A). 6

3. A particle is acted by constant forces 3i – j + 2k, – i + 3j + k and i + j – 2k and is displaced from the point (–1, 2, 3) to (2, – 1, 5). Calculate the total work done by the forces. 6

4. One card is drawn from a well shuffled pack of 52 cards. If E is the event "The card drawn is a king or an ace" and F is the event "The card drawn is an ace or a jack" then find the conditional probability of the event E, when the event F has already occured. 6

5. Simplify :

$$\frac{\sin(\pi+\theta)}{\cos(\frac{3\pi}{2}-\theta)}+\frac{\tan(-\theta)}{\cot(\frac{\pi}{2}+\theta)}+\frac{\sec(\pi-\theta)}{\operatorname{cosec}(\frac{\pi}{2}-\theta)}$$ **6**

6. Prove that : $\cos 20^\circ \cos 40^\circ \cos 60^\circ \cos 80^\circ = \frac{1}{16}$ **6**

7. Find the amplitude of $(-\sqrt{3}+i)$ and represent it in Argand diagram. **6**

8. Evaluate : $\lim_{\theta \to \frac{\pi}{2}} \frac{\cot\theta}{\frac{\pi}{2}-\theta}$ **6**

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