Register				
Number				

1 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.



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SECTION - A

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

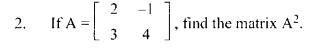
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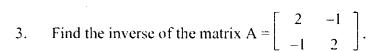
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4. If
$$\overrightarrow{a} = i + 2j + 3k$$
, and $\overrightarrow{b} = 4i - j - 5k$, find $\overrightarrow{a} + \overrightarrow{b}$ and $|\overrightarrow{a} + \overrightarrow{b}|$.

3

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

3

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[Turn over

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

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

3

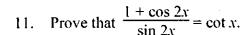
8. Find the value of cos 15°. 3

Show that: 9.

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

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





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Evaluate i⁺⁹ and i⁻⁹.

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

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

3

SECTION - B

- 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.
- 19. If $\vec{a} = i + j + 2k$ and $\vec{b} = 2i j + k$, then show that $(\vec{a} + \vec{b})$ is perpendicular to $(\vec{a} \vec{b})$.
- 20. If $x = \log_a bc$, $y = \log_b ca$, $z = \log_c ab$, then prove that $\frac{1}{1+x} + \frac{1}{1+y} + \frac{1}{1+z} = 1$.
- 21. Find the numerical value without using trigonometric table/calculator sin 120° · cos 330° sin 240° · cos 390°.
- 22. Prove that $\frac{\cos 17^\circ + \sin 17^\circ}{\cos 17^\circ \sin 17^\circ} = \tan 62^\circ.$
- 23. If $\cos \alpha = \frac{3}{5}$ and $\cos \beta = \frac{5}{13}$, find the value of $\sin (\alpha + \beta)$.

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- 24. Prove that $\frac{1 + \sin 2A + \cos 2A}{1 + \sin 2A \cos 2A} = \tan (90^{\circ} A).$
- 25. Evaluate $\lim_{x \to 0} \frac{\sin 4x \sin 2x}{\sin 6x + \sin 2x}$.

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

- 28. If A (2, 5, 7), B (3, 9, 4), C (-2, 5, 7) are three vertices of parallelogram, then find its area.
- 29. A pair of dice is thrown once. If the two numbers appearing are different, find the probability that sum of numbers is 6.
- 30. If $\tan \alpha = 4/3$ and α is acute, then find the value of $\frac{2 \sin \alpha 3 \cos \alpha}{3 \sin \alpha + \cos \alpha}$.
- 31. In a triangle ABC, prove that $\sin 2A + \sin 2B + \sin 2C = 4 \sin A \cdot \sin B \cdot \sin C$.
- 32. Express $-\sqrt{3}$ i, in polar form.



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



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