# COMMON SECOND MID-TERM TEST - 2019

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Standard XI

Reg.No.

Time: 1.30 hours. MATHEMATICS Marks: 45

## Section - I

**I. Choose the correct answer:** $10 \times 1 = 10$

1. If A and B are two matrices such that A + B and AB are both defined, then
   a) A and B are two matrices not necessarily of same order
   b) A and B are same order square matrices
   c) Number of columns of A is equal to the number of rows of B
   d) A = B

2. If $A = \begin{bmatrix} \lambda & 1 \\ -1 & -\lambda \end{bmatrix}$, then for what value of $\lambda$, $A^2 = 0$?
   a) 0 b) $\pm 1$ c) $-1$ d) 1

3. If A is a square matrix, then which of the following is not symmetric?
   a) $A + A^T$ b) $AA^T$ c) $A^TA$ d) $A - A^T$

4. If the points $(x,-2)$, $(5,2)$, $(8,8)$ are collinear, then x is equal to
   a) $-3$ b) $\frac{1}{3}$ c) 1 d) 3

5. If $\vec{a} + 2\vec{b}$ and $3\vec{a} + m\vec{b}$ are parallel, then the value of m is
   a) 3 b) $\frac{1}{3}$ c) 6 d) $\frac{1}{6}$

6. If ABCD is a parallelogram, then $\overrightarrow{AB} + \overrightarrow{AD} + \overrightarrow{CB} + \overrightarrow{CD}$ is equal to
   a) $2(\overrightarrow{AB} + \overrightarrow{AD})$ b) $4\overrightarrow{AC}$ c) $4\overrightarrow{BD}$ d) $\vec{0}$

7. If $|\vec{a} + \vec{b}| = 60$, $|\vec{a} - \vec{b}| = 40$ and $|\vec{b}| = 46$, then $|\vec{a}|$ is
   a) 42 b) 12 c) 22 d) 32

8. $\lim_{x \to \infty} \frac{\sin x}{x} =$
   a) 1 b) 0 c) $\infty$ d) $-\infty$

9. $\lim_{x \to 0} \frac{a^x - b^x}{x} =$
   a) $\log ab$ b) $\log\left(\frac{a}{b}\right)$ b) $\log\left(\frac{b}{a}\right)$ d) $\frac{a}{b}$

10. $\lim_{x \to 0} \frac{xe^x - \sin x}{x} =$
    a) 1 b) 2 c) 3 d) 0

## Section - II

**II. Answer any 3 questions: (Ques.No.15 is compulsory)** $3 \times 2 = 6$

11. Determine the value of x + y if $\begin{bmatrix} 2x+y & 4x \\ 5x-7 & 4x \end{bmatrix} = \begin{bmatrix} 7 & 7y-13 \\ y & x+6 \end{bmatrix}$

12. Find the projection of the vector $\hat{i} + 3\hat{j} + 4\hat{k}$ on $2\hat{i} + 6\hat{j} + 3\hat{k}$.

13. For any vector $\vec{r}$, prove that $\vec{r} = (\vec{r}.\hat{i})\hat{i} + (\vec{r}.\hat{j})\hat{j} + (\vec{r}.\hat{k})\hat{k}$.

14. If $f(x) = \sqrt{x}$, $x \geq 0$, Does $\lim_{x \to 0} f(x)$ exist?

15. If D is the mid point of the side BC of a triangle ABC, prove that $\overrightarrow{AB} + \overrightarrow{AC} = 2\overrightarrow{AD}$.

## Section - III

**III. Answer any 3 questions: (Ques.No.20 is compulsory)** $3 \times 3 = 9$

16. For what values of x, the matrix $A = \begin{bmatrix} 0 & 1 & -2 \\ -1 & 0 & x^3 \\ 2 & -3 & 0 \end{bmatrix}$ is skew-symmetric?

17. If $\cos 2\theta = 0$, find $\begin{vmatrix} 0 & \cos\theta & \sin\theta \\ \cos\theta & \sin\theta & 0 \\ \sin\theta & 0 & \cos\theta \end{vmatrix}^2$.

18. Let $\vec{a}$, $\vec{b}$, $\vec{c}$ be unit vectors such that $\vec{a}.\vec{b} = \vec{a}.\vec{c} = 0$ and the angle between $\vec{b}$ and $\vec{c}$ is $\pi/3$. Prove that $\vec{a} = \pm \frac{2}{\sqrt{3}}(\vec{b} \times \vec{c})$.

19. $\lim_{x \to 0} \frac{(2+x)^5 - 2^5}{x} = ?$

20. Show that the points $2\hat{i} + 3\hat{j} - 5\hat{k}$, $3\hat{i} + \hat{j} - 2\hat{k}$, $6\hat{i} - 5\hat{j} + 7\hat{k}$ are collinear.

## Section - IV

**IV. Answer all the questions:** $4 \times 5 = 20$

21. a) Express $\begin{bmatrix} 3 & 3 & -1 \\ -2 & -2 & 1 \\ -4 & -5 & 2 \end{bmatrix}$ as the sum of a symmetric and skew symmetric matrix. ***(or)***

b) Prove that $\begin{bmatrix} b+c & bc & b^2c^2 \\ c+a & ca & c^2a^2 \\ a+b & ab & a^2b^2 \end{bmatrix} = 0$

22. a) Prove that the vectors $5\hat{i} + 6\hat{j} + 7\hat{k}$, $7\hat{i} - 8\hat{j} + 9\hat{k}$, $3\hat{i} + 20\hat{j} + 5\hat{k}$ are coplanar. ***(or)***

b) If ABCD is a quadrilateral and E and F are the mid-points of AC and BD, then prove that $\overrightarrow{AB} + \overrightarrow{AD} + \overrightarrow{CB} + \overrightarrow{CD} = 4\overrightarrow{EF}$.

23. a) Show that the position vector of the points $2\hat{i} + 4\hat{j} + 3\hat{k}$, $4\hat{i} + \hat{j} + 9\hat{k}$, $10\hat{i} - \hat{j} + 6\hat{k}$ form a right angled triangle. ***(or)***

b) Prove that $\lim_{n \to \infty} \frac{1+2+3+\ldots+n}{3n^2+7n+2} = \frac{1}{6}$

24. a) Evaluate $\lim_{x \to 0} \frac{1}{x^2+x^3}$ ***(or)***

b) Prove using factor theorem, $\begin{vmatrix} 1 & x^2 & x^3 \\ 1 & y^2 & y^3 \\ 1 & z^2 & z^3 \end{vmatrix} = (x-y)(y-z)(z-x)(xy+yz+zx)$

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