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Virudhunagar District Schools
Common Second Mid Term Test, November - 2018

Time: 1.15 Hrs.

Standard 11
MATHEMATICS

Marks: 50

Part - A

Answer all the questions: **10×1=10**

1) The point on the line $2x-3y = 5$ is equidistance from (1, 2) and (3, 4) is
a) (7, 3) b) (−2, 3) c) (4, 1) d) (1, −1)

2) The area of the triangles formed by the lines $x^2-4y^2 = 0$ and $x = a$ is
a) $\frac{2}{\sqrt{3}}a^2$ b) $\frac{\sqrt{3}}{2}a^2$ c) $\frac{1}{2}a^2$ d) $2a^2$

3) Find the distance between the line $4x+3y+4 = 0$ and a point (7, −3).
a) $\frac{23}{5}$ b) $\frac{5}{23}$ c) $\frac{-23}{25}$ d) $\frac{23}{25}$

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

5) The matrix A satisfying the equation $\begin{bmatrix} 1 & 3 \\ 0 & 1 \end{bmatrix} A = \begin{bmatrix} 1 & 1 \\ 0 & -1 \end{bmatrix}$
a) $\begin{bmatrix} 1 & -4 \\ 1 & 0 \end{bmatrix}$ b) $\begin{bmatrix} 1 & 4 \\ -1 & 0 \end{bmatrix}$ c) $\begin{bmatrix} 1 & -4 \\ 1 & 1 \end{bmatrix}$ d) $\begin{bmatrix} 1 & 4 \\ 0 & -1 \end{bmatrix}$

6) The value of the determinant $\begin{vmatrix} 4\sin^2\theta & \cos 2\theta \\ -\cos 2\theta & \cos^2\theta \end{vmatrix}$ is
a) $8\sin^2\theta\cos^2\theta$ b) $4\sin 2\theta\cos 2\theta$
c) 1 d) $4\cos^3\theta - 3\cos\theta$

7) In a determinant the elements of two rows are proportional, then the determinant is equal to

a) Δ b) $-\Delta$ c) $K\Delta$ d) 0

8) If the projection of $\vec{b}$ on $\vec{a}$ is equal to $\vec{a}.\vec{b}$ then $\vec{a}$ is

a) parallel to $\vec{b}$ b) perpendicular to $\vec{b}$

c) unit vector d) zero vector

9) If $|\vec{a}+\vec{b}| = 60$; $|\vec{a}-\vec{b}| = 40$ and $|\vec{b}| = 46$ then $|\vec{a}|$ is

a) 12 b) 22 c) 42 d) 32

10) If $\vec{a} = \vec{i}+\vec{j}+\vec{k}$, $\vec{b} = 2\vec{i}+x\vec{j}+\vec{k}$, $\vec{c} = \vec{i}-\vec{j}+4\vec{k}$ and $\vec{a}.(\vec{b}\times\vec{c}) = 70$, then x is equal to

a) 10 b) 26 c) 7 d) 5

Part - B

Answer any 4 questions. Q.No. 15 is compulsory: **4×2=8**

11) The length of the perpendicular drawn from the origin to a line is 12 and makes an angle 150° with positive direction of the x-axis. Find the equation of the line.

12) Find the area of the triangle whose vertices are (0, 0), (1, 2) and (4, 3).

13) Find the values of m for which $m(\vec{i}+\vec{j}+\vec{k})$ is an unit vector.

14) For any vector $\vec{a}$ prove that

$$|\vec{a}\times\vec{i}|^2 + |\vec{a}\times\vec{j}|^2 + |\vec{a}\times\vec{k}|^2 = 2|\vec{a}|^2.$$

15) Population of a city in the year 2005 and 2010 are 1,35,000 and 1,45,000 respy. Find the approximate population in the year 2015 (Assuming that the growth of population is constant).

Part - C

Answer any 4 questions. Q.No. 20 is compulsory: **4×3=12**

16) Find the image of the point (−2, 3) about the line $x+2y-9=0$.

17) Prove that $\begin{vmatrix} 1 & 1 & 1 \\ x & y & z \\ x^2 & y^2 & z^2 \end{vmatrix} = (x-y)(y-z)(z-x)$.

18) If $\cos 2\theta = 0$ determine $\begin{vmatrix} 0 & \cos\theta & \sin\theta \\ \cos\theta & \sin\theta & 0 \\ \sin\theta & 0 & \cos\theta \end{vmatrix}^2$.

19) If D and E are the midpoints of sides AB and AC of a triangle ABC, prove that $\overrightarrow{BE}+\overrightarrow{DC}=\frac{3}{2}\overrightarrow{BC}$.

20) If $\bar{a}, \bar{b}$ and $\bar{c}$ are three unit vectors satisfying $\bar{a}-\sqrt{3}\bar{b}+\bar{c}=\bar{0}$ then find the angle between $\bar{a}$ and $\bar{c}$.

Part - D

Answer all the questions: **4×5=20**

21) If the pair of straight lines $x^2-2hxy-y^2=0$ bisect the angle between the pair of straight lines $x^2-2\ell xy-y^2=0$ show that the later pair also bisects the angle between the former.

(OR)

Prove that $|A| = \begin{vmatrix} (b+c)^2 & a^2 & a^2 \\ b^2 & (c+a)^2 & b^2 \\ c^2 & c^2 & (a+b)^2 \end{vmatrix} = 2abc(a+b+c)^3$

22) The medians of a triangle are concurrent.

(OR)

Find the equation of the locus of a point such that th sum of the squares of the distance from the points (3, 5 (1, −1) is equal to 20.

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23) Show that the points whose position vectors $4\vec{i}+5\vec{j}+\vec{k}$, $-\vec{j}-\vec{k}$, $3\vec{i}+9\vec{j}+4\vec{k}$ and $-4\vec{i}+4\vec{j}+4\vec{k}$ are coplanar.

(OR)

Show that $\begin{vmatrix} a^2+x^2 & ab & ac \\ ab & b^2+x^2 & bc \\ ac & bc & c^2+x^2 \end{vmatrix}$ is divisible by x^4.

24) Suppose the Government has decided to erect a new electrical power Transmission substation to provide better power supply to two villages namely A and B. The substation has to be on the line ℓ. The distance of villages A and B from the foot of the perpendicular P and Q on the line l are 3 km and 5 km respectively and the distance between P and Q is 6 km. (i) What is the smallest length of cable required to connect the two villages (ii) Find the equation of the cable lines that connect the power station to two villages. (Using the knowledge in coni[illegible] the principle of reflection allows for [illegible] problem.

(OR)

i) The projection of $\vec{a}$ on $\vec{b}$ is $|\vec{a}\times\vec{b}|$ and $\vec{b}=\frac{\vec{i}+\vec{j}}{\sqrt{2}}$. Find the angle between $\vec{a}$ and $\vec{b}$.

ii) Find the magnitude of $\vec{a}\times\vec{b}$ if $\vec{a}=2\vec{i}+\vec{j}+3\vec{k}$, $\vec{b}=3\vec{i}+5\vec{j}-2\vec{k}$.
