1) If A is a skew symmetric matrix and n is an even positive integer, then A^n is a

a) Symmetric Matrix
b) Skew Symmetric Matrix
c) Diagonal Matrix
d) Scalar Matrix

If $A = \begin{bmatrix} 1 & 3 \\ 3 & 4 \end{bmatrix}$ and $A^2 - kA - 5I = 0$

then $k =$ ____________

a) 5 b) 3

c) 7 d) 11

$$3)\ \text{If } f(x) = \begin{vmatrix} 1 & x & x+1 \\ 2x & x(x-1) & x(x+1) \\ 3x(x-1) & x(x-1)(x-2) & (x+1)x(x-1) \end{vmatrix}$$

$$\text{then } f(100) =$$

a) 0 b) 1 c) 100 d) -100

4) Let $(G, \cdot)$ be a grou

if $(ab)^2 = a^2b^2 \ \forall a,b \in G$

then G is __________

a)Monoid

b) only Semigroup

c) Abelian

d) Non Abelian

[illegible]

[illegible]

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If H_1 and H_2 [illegible]
subgroups [illegible]
[illegible]

a) [illegible] H_1 [illegible] H_2 [illegible]
b) [illegible] H_1 [illegible] H_2
c) H_1 [illegible] H_2 is subgroup
d) H_1 [illegible] H_2 is subgroup

7) If $|\vec{a}| = 1$, $|\vec{b}| = 1$ and $|\vec{a}+\vec{b}| = 1$

then $|\vec{a}-\vec{b}| =$ ______________

a) $\sqrt{2}$ b) 2 c) $\sqrt{3}$ d) 1

8) If the vectors 2i + 3j – 4k and ai+bj+ck are orthogonal to each other then a, b, c can have the values.

a)a = 2, b=3, c= -4

b) a=4, b=4, c=5

c) a=4, b=4, c=-5

d)a=4, b= - 4, c=2

9) Let $\vec{a} = 2\hat{i} + \hat{j} - 2\hat{k}$ and $\vec{b} = \hat{i} + \hat{j}$. If $\vec{c}$ is a vector such that $\vec{a} \cdot \vec{c} = |\vec{c}|$ and $|\vec{c} - \vec{a}| = 2\sqrt{2}$ and the angle between $\vec{a} \times \vec{b}$ and $\vec{c}$ is 30° then $\left|\left(\vec{a} \times \vec{b}\right) \times \vec{c}\right| =$ ________.

a) 2/3 b) 3/2 c)2 d) 3

10)The g.c.d. of 1080 and 675 is

a) 135 b) 145 c)125 d) 225

11) The remainder obtained when
64 x 65 x 66 is divided by 67 is

a) 60 b) 61 c)62 d) 63

12) If ’a’ and ‘b’ are +ve integers such that a^2-b^2 is a prime number then

a) $a^2-b^2 = 0$

b) $a^2-b^2 = 1$

c) $a^2-b^2 = a + b$

d) $a+b = 1$

13) The value of

$$\begin{vmatrix} \log x & \log y & \log z \\ \log 2x & \log 2y & \log 2z \\ \log 3x & \log 3y & \log 3z \end{vmatrix} =$$

[illegible]

14) The Value of $\begin{vmatrix} a & b & c & d \\ -a & b & c & d \\ -a & -b & c & d \\ -a & -b & -c & d \end{vmatrix}$ is

a)8abcd b) abcd

c) 4abcd d) 6abcd

15) If $a^2+b^2+c^2=0$ and

$$\begin{vmatrix} b^2+c^2 & ab & ac \\ ab & c^2+a^2 & bc \\ ac & bc & a^2+b^2 \end{vmatrix}$$

$= k\,a^2 b^2 c^2$ then $k =$ _____

a)1 b) 2 c) 3 d) 4

[illegible]

a)1 b) 4 c) 2 d) 3

[illegible]

a)2 b) 1 c) 4 d) 3

18) In any group, the number of improper subgroups is ______

a)2 b) 3 c) 4 d) 1

[illegible]

a)Perpendicular

b) like parallel

c) unlike parallel

d) collinear

20) Let a, b, c be distinct non negative real numbers. If the vectors $ai+aj+ck$, $i + k$ and $ci + cj + bk$ are coplanar then ‘c’ is

a)The A.M. between ‘a’ and ‘b’.

b)The G.M. between ‘a’ and ‘b’

c)The H.M. between ‘a’ and ‘b’

d)Equal to zero

2) If θ is the angle between $\vec{a}$ and $\vec{b}$

then $\dfrac{|\vec{a} \times \vec{b}|}{\vec{a} \cdot \vec{b}} =$ ____________

a) $\tan\theta$ b) $-\tan\theta$ c) $\cot\theta$ d) $-\cot\theta$

22) If $n > 1$ is even then $2^{2n}-1$ is divided by

a) 5 b) 7 c)15 d) 11

23) The digit in the unit place of $183! + 3^{183}$ is

a) 7 b) 6 c)3 d) 0

[illegible]

[illegible] [illegible]

[illegible] [illegible]

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25) If A is 3 x 3 matrix and det (3A) = k(det A) then k=____

a)9 b) 6 c) 3 d) 27

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26) If ω is an imaginary cube root of unity then

$$\begin{vmatrix} 1 & \omega & \omega^5 \\ \omega & \omega^2 & 1 \\ \omega^3 & 1 & \omega^4 \end{vmatrix} =$$

a) 0 b) 1 c) ω d) ω^2

27) The characteristic roots of the matrix

$$A = \begin{bmatrix} a & 0 & 0 \\ x & b & 0 \\ y & z & c \end{bmatrix} ar$$

a) x, y, z

b) a, b, c

c) ax, by, cz

d) a/x, b/y, c/y

[illegible]

[illegible]

[illegible]

a)1 b) 5 c) 11 d) 7

30) If every element of a group $(G$
is it’s own inverse then it is

a)Finite

b) Infinite

c) non abelian

d) abelian

[illegible]

[illegible]

[illegible]

3) If $[\vec{a}\;\vec{b}\;\vec{c}] = 1$ then

$$[\vec{a}\,\vec{b}\quad \vec{b}\,\vec{c}\quad \vec{c}\,\vec{a}] = \_\_\_\_$$

a) 48 b) 36 c)24 d) 60

33) If $|\vec{a}+\vec{b}| = |\vec{a}-\vec{b}|$ then

a) $\vec{a}$ is $\parallel$ el to $\vec{b}$ b) $\vec{a}$ is $\perp$ r to $\vec{b}$

c) $\vec{a} = \frac{1}{2}\vec{b}$ d) Angle between $\vec{a}$ & $\vec{b}$ is $\frac{2}{3}$

34) The sum of all +ve divisors of 960 excluding 1 and itself is

a) 3047 b) 2180
c) 2087 d) 3048

35) The last digit in 7^{300} is

a) 1 b) 3 c)7 d) 9

36) If A is square matrix such that

$$A(\text{adj}\,A)=\begin{bmatrix}4&0&0\\0&4&0\\0&0&4\end{bmatrix} \text{ then } |\text{adj}\,A|$$

a)4 b) 16 c) 64 d) 256

37) If $\overline{a}^{1}+\overline{b}^{1}+\overline{c}^{1}=0$ such that

$$\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = \lambda$$

then the value of λ is ____

a)0 b) abc c)-abc d) $a^2b^2c^2$

$$38.\ \text{If}\ A = \begin{bmatrix} 2 & 3 & 4 \\ 0 & 1 & 5 \\ 0 & 0 & 3 \end{bmatrix}\ \text{then}\ \left|A^{-1}\right| = \_\_\_\_$$

a) 6 b) 1 / 6 c) 0 d) 2

39) In a group $(G, \cdot)$ $a^5 = b^4 = e$ and $ab = ba^3$ then a^2b is____

a) ab b) ba c) b^3a^2 d) ba^3

4) The set of matrices $M = \begin{bmatrix} x & -x \\ -x & x \end{bmatrix}$, $x \neq 0$ forms a group under multiplication with the identity

$a)\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ $b)\begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}$

$c)\begin{bmatrix} -1 & 1 \\ 1 & -1 \end{bmatrix}$ $d)\begin{bmatrix} \frac{1}{2} & \frac{-1}{2} \\ \frac{-1}{2} & \frac{1}{2} \end{bmatrix}$

[illegible]

[illegible]

then $(\text{Adj}\,A)^{-1}$ is ________

[illegible] [illegible]

[illegible] [illegible]

42) The set of integers Z w.r.t. the binary operation * defined as

[illegible]

is a group. The identity element is

a)0 b) -1 c) 2 d) 1

43) If ω is an imaginary cube root of unity then $\begin{vmatrix} 1 & \omega^n & \omega^{2n} \\ \omega^{2n} & 1 & \omega^n \\ \omega^n & \omega^{2n} & 1 \end{vmatrix}$ has the value

a) 0 b) 1 c) ω d) ω^2

44)The vectors i - 3j - 5k, 3i - 4j - 4k

and 2i –j + k represents the sides of

a)An equilateral triangle

b) Isosceles triangle

c) Right angled triangle

d)Isosceles right angled triangle

45) The vector i + xj +3k is rotated through an angle θ and is doubled in magnitude and it becomes 4i+(4x-2)j + 2k. The value of ‘x’ is _____.

[illegible]

46) If $\vec{a}$ and $\vec{b}$ are unit vectors and θ is the angle between them then $|\vec{a} - \vec{b}|$ = ______.

a) $2\cos\theta$ b) $2\sin\theta$ c) $2\cos\frac{\theta}{2}$ d) $2\sin\frac{\theta}{2}$

4) If $\vec{a}, \vec{b}, \vec{c}$ are non coplanar vectors and $\vec{u}, \vec{v}, \vec{w}$ are three vectors defined by

$$\vec{u} = \frac{\vec{b} \times \vec{c}}{\left[\vec{a}\,\vec{b}\,\vec{c}\right]}, \quad \vec{v} = \frac{\vec{c} \times \vec{a}}{\left[\vec{a}\,\vec{b}\,\vec{c}\right]}, \quad \vec{w} = \frac{\vec{a} \times \vec{b}}{\left[\vec{a}\,\vec{b}\,\vec{c}\right]}$$

then $\left(\vec{a}+\vec{b}\right)\cdot\vec{u} + \left(\vec{b}+\vec{c}\right)\cdot\vec{v} + \left(\vec{a}+\vec{c}\right)\cdot\vec{w} =$ ______

a) 0 b) 1 c) 2 d) 3

4) [illegible]

a) 0 b) -4 c)4 d) None

[illegible]

a) 4 b) 3 c)5 d) 0

50) Which of the following linear congruence has no solution?

[illegible] [illegible]

[illegible] [illegible]