SRIGAYATRI EDUCATIONAL INSTITUTIONS

INDIA

SR MPC

TRIGNOMETRY QUESTION BANK UT-2

TRIGONOMETRIC RATIOS

1. If $\sin\theta+\cos\theta=\frac{1}{5}$ and $0\le\theta<\pi$ then $\tan\theta$ is

1) $\frac{-4}{3}$ 2) $\frac{-3}{4}$ 3) $\frac{3}{4}$ 4) $\frac{4}{3}$

2. If $A=\{x:\sin x-\cos x=\sqrt{2}\cos x\}$ and $B=\{x:\sin x+\cos x=\sqrt{2}\sin x\}$ be two sets. Then

1) $A\subset B$ and $B-A\not\equiv\phi$ 2) $B\not\subset A$ 3) $A\not\subset B$ 4) $A=B$

3. If $\sin x+\sin^2 x=1$ then the value of $\cos^{12}x+3\cos^{10}x+3\cos^8 x+\cos^6 x-2$ is equal to

1) 0 2) 1 3) – 1 4) 2

4. If $\sec^4 x+\sec^2 x=10+\tan^4 x+\tan^2 x$ than $\sin^2 x=$

1) $-\frac{4}{5}$ 2) $\frac{4}{5}$ 3) $\frac{3}{5}$ 4) $\frac{1}{5}$

5. If $f_r(x)=\frac{1}{r}(\sin^r x+\cos^r x)$ where $x\in R, r\ge 1$ than $f_4(x)-f_6(x)=$

1) $\frac{1}{6}$ 2) $\frac{1}{3}$ 3) $\frac{1}{9}$ 4) $\frac{1}{12}$

6. If $a\sin^2 A+b\cos^2 A=c, b\sin^2 B+a\cos^2 B=d$ and $a\tan A=b\tan B$ then $\frac{a^2}{b^2}=$

1) $\frac{(a-d)(c-a)}{(b-c)(d-b)}$ 2) $\frac{(b-c)(a-d)}{cd}$ 3) $\frac{(b-c)(a-c)}{(ad)}$ 4) $\frac{d-a}{d+b}$

7. **The minimum value of** $f(x)=\frac{\sin x}{|\sin x|}+\frac{\cos x}{|\cos x|}+\frac{\tan x}{|\tan x|}+\frac{\cot x}{|\cot x|}$

1) 1 2) 2 3) 3 4) – 2

8. **The greatest among** $(\sin 1+\cos 1),(\sqrt{\sin 1}+\sqrt{\cos 1}),(\sin 1-\cos 1)$

1) $\sqrt{\sin 1}+\sqrt{\cos 1}$ 2) $\sin 1+\cos 1$ 3) $\sin 1-\cos 1$ 4) all are equal

9. If $\tan A,\tan B,\tan C$ are the roots of $x^3-px^2-r=0$ than the value of $(1+\tan^2 A)(1+\tan^2 B)(1+\tan^2 C)=$

1) $1-(p-r)^2$ 2) $1+(p-r)^2$ 3) $(p-r)^2$ 4) 1

10. If $(\tan A-\tan B)^2,(\tan B-\tan C)^2,(\tan C-\tan A)^2$ are in A.P then $\tan A-\tan B,\tan B-\tan C,\tan C-\tan A$ are in

1) A.P 2) G.P 3) H.P 4) all the above

11. If $\frac{\sin^4 A}{2}+\frac{\cos^4 A}{3}=\frac{1}{5}$ then

1) $\tan^2 A=\frac{2}{3}$ 2) $\tan^2 A=\frac{4}{3}$ 3) $\tan^2 A=\frac{1}{3}$ 4) $\tan^2 A=\frac{6}{7}$

12. **If** $f(x)=\left(\log\left(\log_{\frac{1}{3}}(\sin x+a)\right)\right)$ defined every real value of x, then the number of possible values of a

1) 1 2) 2 3) 3 4) 4

13. **If** $b>1, \sin t>0, \cos t>0$ and $\log_b^{\sin t}=x$ then $\log_b^{\cos t}$ is equal to

1) 0 2) $\log_b^{1-b^2}$ 3) 1 4) $\frac{1}{2}\log_b^{(1-b)^{2x}}$

14. **If** α, β are complimentary angles, $\sin\alpha=\frac{3}{5}$ then $\cos\alpha\cos\beta-\sin\alpha\sin\beta=$

1) 1 2) 0 3) – 1 4) $\sqrt{2}$

15. **The value of** $(2\sin^2 91°-1)(2\sin^2 92°-1)...(2\sin^2 180°-1)$ is equal to :

1) 1 2) 2 3) 0 4) 3

16. $\cos^2(125°-\alpha)-\cos^2(55+\alpha)=$

1) – 1 2) 1 3) 0 4) 2

17. **If** $y=(\sin A+\cos ecA)^2+(\cos A+\sec A)^2$, then the minimum value of y, $A\in R$ is

1) 9 2) 8 3) 7 4) 6

18. **The greatest value of** $\sin^4 x+\cos^4 x$ is

1) 1 2) 2 3) 3 4) – 1

19. **If** $\sec A$ and $\cos ec\,A$ are the roots of $x^2-px+q=0$ then

1) $p^2=q(q-2)$ 2) $p^2=q(q+2)$ 3) $p^2+q^2=2q$ 4) $p=q$

20. **If the equation** $\cot^4 A-2\cos ec^2 A+a^2=0$ has at least one solution then the possible integral value of a

1) 2, 3 2) – 2, – 3 3) – 1, 0, 1 4) 1, 2, 3

21. **The expression** $(\alpha\tan\gamma+\beta\cot\gamma)(\alpha\cot\gamma+\beta\tan\gamma)-4\alpha\beta\cot^2 2\gamma$ depends on

1) α and β 2) β and γ 3) α and γ 4) α, β and γ

22. **If** $\sin\alpha+\cos\alpha=b$ then $|\sin\alpha-\cos\alpha|$

1) $\sqrt{1-a^2}$ 2) $\sqrt{2-a^2}$ 3) $\sqrt{3-a^2}$ 4) $\sqrt{1-(a^2-1)}$

23. **If** $\tan A+\cot A=2$ than $\sqrt{\tan A}+\sqrt{\cot A}=$

1) 1 2) 2 3) 3 4) 4

24. **If** $\cos(\alpha-\beta)=-1$ then $\cos\alpha+\cos\beta=$

1) 1 2) 2 3) 0 4) 3

25. $\sin^2 A\cos^2 B+\cos^2 A\sin^2 B+\sin^2 A\sin^2 B+\cos^2 A\cos^2 B=$

1) – 1 2) 0 3) 1 4) 2

26. **If** $\frac{x}{a}\cos\theta+\frac{y}{b}\sin\theta=1, \frac{x}{a}\sin\theta-\frac{y}{b}\cos\theta=1$ then $\frac{x^2}{a^2}+\frac{y^2}{b^2}=$

1) 1 2) – 1 3) 2 4) 3

27. **If** $\tan(\alpha+\beta)=\sqrt{3}$, $\tan(\alpha-\beta)=1$ then $\tan 18\beta=$

1) 2 2) 1 3) – 1 4) 4

28. **If** $f(x)=x^3-3x+5$ then $f\left(\sin\frac{3\pi}{2}\right)+f\left(\cos\frac{3\pi}{2}\right)=$

1) 12 2) 7 3) 5 4) 2

29. **If** $\tan\theta, 2\tan\theta+2, 3\tan\theta+3$ are in G.P then the value of $\frac{7-5\tan\theta}{9-4\sqrt{\tan^2\theta+1}}=$

1) $\frac{21}{9+2\sqrt{17}}$ 2) $\frac{21}{9-4\sqrt{15}}$ 3) $\frac{27}{9-4\sqrt{17}}$ 4) 1

30. If $a=\cos 3, b=\sin 8$ than

1) $a<b$ 2) $a>b$ 3) $ab>0$ 4) $a-b=0$

31. $\cos^2 5°+\cos^2 10°+\cos^2 15°+....+\cos^2 360°=$

32. If $f(x)=\sin^2 x+\operatorname{cosec}^2 x$, if $f(x)\geq k$, then k =

33. If $\theta=\frac{11\pi}{6}$ then $\cos\theta+\sin\theta=$

34. $a\sin x=b\cos x=\frac{2c\tan x}{1-\tan^2 x}$ and $\left(a^2-b^2\right)^2=kc^2\left(a^2+b^2\right)$ then k =

35. $\cos\theta+\cos^2\theta=1$ then $a\sin^{12}\theta+b\sin^{10}\theta+c\sin^8\theta+d\sin^6\theta=1\Rightarrow\frac{b+c}{a+d}=$

36. $\sin x+\sin^2 x+\sin^3 x=1$ then $\cos^6 x-4\cos^4 x+8\cos^2 x=$

37. If $\cos 70°-\sin 70°<k$ then k =

38. If $\sec^4\theta+\sec^2\theta=10+\tan^4\theta+\tan^2\theta$ then $\sin^2\theta=$

39. If $\sin\theta_1+\sin\theta_2+\sin\theta_3=3\Rightarrow\cos\theta_1+\cos\theta_2+\cos\theta_3=$

40. If $\tan(\alpha+\beta)=\sqrt{3}, \tan(\alpha-\beta)=1$ then $\cot 6\beta=$

COMPOUND ANGLES

1. **If** $\sin A+\cos B=\alpha, \sin B+\cos A=\beta$ **then** $\sin(A+B)$ **is equal to**

1) $\frac{\alpha^2+\beta^2}{2}$ 2) $\frac{\alpha^2-\beta^2+2}{2}$ 3) $\frac{\alpha^2+\beta^2-2}{2}$ 4) $\frac{\alpha^2-\beta^2-2}{2}$

2. **If** $\alpha+\beta+\gamma=2\pi$ **then** $\sum\tan\frac{\alpha}{2}=$

1) $\tan\frac{\alpha}{2}\tan\frac{\beta}{2}\tan\frac{\gamma}{2}$ 2) $-\tan\frac{\alpha}{2}\tan\frac{\beta}{2}\tan\frac{\gamma}{2}$

3) $\tan\frac{\alpha+\beta}{2}\tan\frac{\gamma}{2}$ 4) $\tan\frac{\alpha+\beta+\gamma}{2}$

3. **If** $\tan(\pi\cos\theta)=\cot(\pi\sin\theta)$ **then the value of** $\cos\left(\theta-\frac{\pi}{4}\right)$ **is**

1) $\frac{1}{\sqrt{2}}$ 2) 0 3) $\frac{1}{2\sqrt{2}}$ 4) 1

4. **If** $\tan\beta=2\sin\alpha\sin\gamma\operatorname{cosec}(\alpha+\gamma)$ **then** $\cot\alpha, \cot\beta$ **and** $\cot\gamma$ **are in**

1) A.P. 2) G.P. 3) H.P. 4) A.G.P.

5. **If** $\tan\left(\frac{\pi}{4}+\frac{y}{2}\right)=\tan^3\left(\frac{\pi}{4}+\frac{x}{2}\right)$ **then** $\frac{3+\sin^2 x}{1+3\sin^2 x}=$

1) $\frac{\sin x}{\sin y}$ 2) $\frac{\sin y}{\sin x}$ 3) $\frac{\cos x}{\cos y}$ 4) $\frac{\cos y}{\cos x}$

6. **If** $\tan^2\frac{\pi-A}{4}+\tan^2\frac{\pi-B}{4}+\tan^2\frac{\pi-C}{4}=1$ **then** ΔABC **is**

1) Isosceles 2) Right-angled 3) equilateral 4) scalene

7. **If** $\frac{\tan(A+B+C)}{\tan(A-B+C)}=\frac{\tan C}{\tan B}(B\neq C)$ **then** $\sin 2A+\sin 2B+\sin 2C=$

1) 3 2) 2 3) 1 4) 0

8. **In** $\Delta ABC, \angle A=\frac{\pi}{4}$ **and** $\tan B\tan C=P$ **then all possible values of P**

1) $(-\infty,\infty)$ 2) $\left(-\infty,3-2\sqrt{2}\right]\cup\left[3+2\sqrt{2},\infty\right)$

3) $\left(-\infty, 3-2\sqrt{2}\right)\cup\left(2\sqrt{2},\infty\right)$ 4) $(-\infty,0)\cup(0,\infty)$

9. **If** $\sin\alpha = A\sin(\alpha+\beta)$ **then** $\tan\alpha =$

1) $\frac{\sin\beta}{\sin\alpha}$ 2) $\frac{A\sin\alpha}{1-B\cos B}$ 3) $\frac{A\sin B}{1-A\cos B}$ 4) 1

10. **If** $\tan\left(x+\frac{\pi}{4}\right)=a$ **then** $\sec^2 x =$

1) $\frac{2\left(a^2+1\right)}{(a+1)^2}$ 2) $\frac{a^2+1}{(a+1)^2}$ 3) $\frac{\left(a^2+1^2\right)}{a+1}$ 4) $\frac{a^2+1}{a-1}$

11. **If** $(1+\tan\alpha)(1+\tan 4\alpha)=2, \alpha\in\left(0,\frac{\pi}{16}\right)$ **then** α **is equal to**

1) $\frac{\pi}{20}$ 2) $\frac{\pi}{30}$ 3) $\frac{\pi}{4r}$ 4) $\frac{\pi}{60}$

12. **In an acute angled triangle** $\cot B\cot C+\cot A\cot C+\cot A\cot B=$

1) 0 2) -1 3) 2 4) 1

13. **If** $\cos 25^o+\sin 28^o=k^3$ **then** $\cos 17^o$ **equal to**

1) $\frac{k^2}{\sqrt{2}}$ 2) $\frac{k^3}{\sqrt{2}}$ 3) $\frac{k}{\sqrt{2}}$ 4) $\frac{k}{2}$

14. **If** $\cos(\theta-\alpha)=a, \cos(\theta-\beta)=b,$ **then** $\sin^2(\alpha-\beta)+2ab\cos(\alpha-\beta)=$

1) a^2+b^2 2) a^2-b^2 3) b^2-a^2 4) a^2-b^2

15. **If** $2\sec 2\theta=\tan\phi+\cot\phi$ **then one of the values of** $\theta+\phi$ **is**

1) $\frac{\pi}{2}$ 2) $\frac{\pi}{4}$ 3) $\frac{\pi}{4}$ 4) $\frac{\pi}{6}$

16. **If** $f(\theta)=\frac{\cot\theta}{1+\cot\theta}$ **and** $\alpha+\beta=\frac{5\pi}{4}$ **then** $f(\alpha)f(\beta)$ **is**

1) 1 2) $\frac{1}{2}$ 3) $\frac{1}{3}$ 4) $\frac{1}{4}$

17. **If** $\cot^2 x=\cot(x-y)\cot(x-z)$ **then** $\cot(2x)$ **is equal to** $\left(x\neq\pm\frac{\pi}{4}\right)$

1) $\frac{\cot y-\cot z}{2}$ 2) $\frac{\cot y+\cot z}{2}$ 3) $\frac{\cot y\cot z}{2}$ 4) $\cot y-\cot z$

18. **The expression** $\cos^2(\alpha+\beta)+\cos^2(\alpha-\beta)-\cos 2\alpha\cos 2\beta$

1) -1 2) 2

3) Independent of α and β 4) dependent of α and β

19. **If** x, y, z, t **are real numbers such that** $x^2+y^2=9, z^2+t^2=4$ **and** $xt-yz=6$ **then the greatest value of** xz **is**

1) 1 2) 2 3) 3 4) 4

20. **If** $\tan^2 A=2\tan^2 B+1$ **then** $\cos^2 A+\sin^2 B$ **is equal to**

1) 0 2) 1 3) 2 4) 3

21. **The value of** $\sum_{k=1}^{100}\sin(kx)\cos(101-k)x$ **is equal to**

1) $50\sin(101x)$ 2) $25\sin(101x)$ 3) 0 4) 1

22. **If** $\cos\theta-\sin\theta=\frac{1}{5}$ **where** $0<\theta<\frac{\pi}{4}$**, then** $\cos 2\theta=$

1) $\frac{4}{5}$ 2) $\frac{7}{25}$ 3) $\frac{1}{2}$ 4) $\frac{1}{5}$

23. **In** $\Delta ABC, \tan(A-B)+\tan(B-C)+\tan(C-A)=$

1) $\tan A\tan B\tan B$
2) $\tan(A+B)\tan(B+C)\tan(C+A)$
3) $\tan(A-B)\tan(B-C)\tan(C-A)$
4) 0

24. $A+B+C=180^o$ **then** $\cos ecA[\sin B\cos C+\cos B\sin C]$

1) 1
2) -1
3) 0
4) 2

25. **If** $\sin(\theta+\alpha)=a$ **and** $\sin(\theta+\beta)=b\left(0<\alpha,\beta,\theta<\frac{\pi}{2}\right)$ **then** $\cos 2(\alpha-\beta)-4ab\cos(\alpha-\beta)=$

1) $1-a^2-b^2$
2) $1-2a^2-2b^2$
3) $2+a^2+b^2$
4) $2-a^2-b^2$

26. $\cot B=2\tan(A-B)$ **then** $2\tan B+\cot B=$

1) $\tan A$
2) $\cot A$
3) $2\tan A$
4) $2\cot A$

27. **If** $\cos\theta=\frac{1}{2}\left(x+\frac{1}{x}\right)$**, then** $\frac{1}{2}\left(x^2+\frac{1}{x^2}\right)$ **is equal to**

1) $\sin 2\theta$
2) $\cos 2\theta$
3) $\tan 2\theta$
4) $\sec 2\theta$

28. $7\cos x-24\sin x=\lambda\cos(x+\alpha),\ 0<\alpha<\frac{\pi}{2}$ **is true for all** $x\in R$ **then**

1) $\lambda=25$
2) $\alpha=\sin^{-1}\frac{21}{25}$
3) $\lambda=-25$
4) $\alpha=\cos^{-1}\frac{17}{25}$

29. **If** $\frac{x}{y}=\frac{\cos A}{\cos B}$ **then** $\frac{x\tan A+y\tan B}{x+y}=$

1) $\cot\frac{A-B}{2}$
2) $\cot\frac{A+B}{2}$
3) $\tan\left(\frac{A+B}{2}\right)$
4) $\tan\left(\frac{A}{2}\right)$

30. **If** $\sin x(\sin x+\cos x)=k$ **has real solutions then** k **may lie in**

1) $\left[\frac{1-\sqrt{2}}{2};\frac{1+\sqrt{2}}{2}\right]$
2) $0(-\infty,0)$
3) $\left(0,-\sqrt{2}\right)$
4) $4\left(-1,\frac{1}{2}\right)$

31. **If** $\sin\theta_1\sin\theta_2-\cos\theta_1\cos\theta_2+1=0$ **then the value of** $\tan\frac{\theta_1}{2}\cot\frac{\theta_2}{2}$ **is**

32. **In** ΔABC**, if** $\sin A\cos B=\frac{1}{4}$ **and** $3\tan A=\tan B$ **then** $\cot^2 A$ **equal to**

33. **If A, B, C are in A.P and** $B=\frac{\pi}{4}$ **then** $\tan A\tan B\tan C=$

34. **The value of** $\cot\frac{7\pi}{16}+2\cot\frac{3\pi}{8}+\cot\frac{15\pi}{16}$ **is**

35. **If** α,β,γ **are acute angles and** $\cos\theta=\frac{\sin B}{\sin A},\cos\phi=\frac{\sin\gamma}{\sin\alpha}$ **and** $\cos(\theta-\phi)=\sin\beta\sin\gamma$ **then the value of** $\tan^2\alpha-\tan^2\beta-\tan^2\gamma$ **is equal to**

36. $3\tan^6 10^o-27\tan^4 10^o+33\tan^2 10=$

37. **If** $\frac{\tan(\alpha+\beta-\gamma)}{\tan(\alpha-\beta+\gamma)}=\frac{\tan\gamma}{\tan\beta}(\beta\neq\gamma)$ **then** $\sin 2\alpha+\sin 2\beta+\sin 2\gamma=$

38. **If** $x=(1+\tan A)(1-\tan B)$ **where** $A-B=\frac{\pi}{4}$ **then** $(x+1)^{x+1}=$

39. **If** $\sin B=\frac{1}{5}\sin(2A+B)$ **then** $\frac{\tan(A+B)}{\tan A}$ **is equal to**

40. **In a** ΔABC**, if** $\sin A\sin B\sin C=\frac{1}{3}$ **then the value of** $\cot A\cot B+\cot B\cot C+\cot C\cot A$ **is**

MULTIPLE & SUBMULTIPLE ANGLES, TRANSFORMATIONS

1. **If** $m = \sin 10^0 \sin 50^0 \sin 60^0 \sin 70^0$ **and** $n = \tan 20^0 \tan 40^0 \tan 60^0 \tan 80^0$, **then** $\frac{n}{m} =$

1) $\frac{16}{\sqrt{3}}$ 2) $8\sqrt{3}$ 3) $16\sqrt{3}$ 4) $\frac{3\sqrt{3}}{16}$

2. **If** θ **is in the interval** $\left(0, \frac{\pi}{2}\right)$ **satisfying the equation** $\cos 2\theta . \sec^4 \theta + \sec^2 \theta = 0$ **then** $\sin^2 \theta =$

1) $\frac{2}{3}$ 2) $\frac{3}{4}$ 3) $\frac{1}{3}$ 4) $\frac{1}{4}$

3. **If** $2\sec 4\alpha = \tan 2\beta + \cot 2\beta$, **then one of the value of** $\alpha + \beta$ **is**

1) $\frac{\pi}{2}$ 2) $\frac{\pi}{4}$ 3) $\frac{\pi}{3}$ 4) $\frac{\pi}{8}$

4. **If** $A + B = 60^0$, **then** $\cos^2 A + \cos^2 B - \cos A \cos B =$

1) $\frac{1}{4}$ 2) $\frac{3}{4}$ 3) $\frac{1}{2}$ 4) $\frac{4}{3}$

5. **If** $\tan A \tan B = \frac{1}{2}$, **then** $(5 - 3\cos 2A)(5 - 3\cos B) =$

1)16 2) 8 3) 12 4) 2

6. **If** $\cot(\alpha + \beta) = 0$, **then** $\sin(\alpha + 3\beta)$ **can be**

1) $-\sin\alpha$ 2) $\cos\beta$ 3) $\cos 2\beta$ 4) $\sin 2\beta$

7. $\sin\left(\frac{\pi}{10}\right)\sin\left(\frac{13\pi}{10}\right) =$

1) $-\frac{1}{4}$ 2) $\frac{3}{4}$ 3) 1 4) $-\frac{1}{2}$

8. **If** $\tan\beta = \cos\theta \tan\alpha$ **then** $\cot^2 \frac{\theta}{2}$

1) $\frac{\cos(\alpha+\beta)}{\sin(\alpha-\beta)}$ 2) $\frac{\sin(\alpha+\beta)}{\sin(\alpha-\beta)}$ 3) $\frac{\sin(\alpha-\beta)}{\sin(\alpha+\beta)}$ 4) $\frac{\cos(\alpha+\beta)}{\cos(\alpha-\beta)}$

9. **The number of all possible integral values of** $n > 2$ **such that** $\sin\left(\frac{\pi}{2n}\right) + \cos\left(\frac{\pi}{2n}\right) = \frac{\sqrt{n}}{2}$ **is**

1) 5 2) 4 3) 7 4) 3

10. $\sqrt{2+\sqrt{2+\sqrt{2+\sqrt{2+\sqrt{2+\sqrt{2}}}}}}$

1) $2\cos\frac{\pi}{64}$ 2) $2\cos\frac{\pi}{32}$ 3) $2\cos\frac{\pi}{128}$ 4) $2\cos\frac{\pi}{16}$

11. $\cos\frac{2\pi}{15}\cos\frac{4\pi}{15}\cos\frac{8\pi}{15}\cos\frac{14\pi}{15} =$

1) $\frac{1}{8}$ 2) $\frac{1}{16}$ 3) $\frac{1}{4}$ 4) $\frac{9}{32}$

12. **If** $\frac{\sin^3\theta - \cos^3\theta}{\sin\theta - \cos\theta} - \frac{\cos\theta}{\sqrt{1+\cot^2\theta}} - 2\tan\theta.\cot\theta = -1$, **then**

1) $\theta \in \left(0, \frac{\theta}{2}\right)$ 2) $\theta \in \left(\pi, \frac{3\pi}{2}\right)$ 3) $\theta \in \left(\frac{\pi}{2}, \pi\right)$ 4) $\theta \in \left(\frac{3\pi}{2}, \pi\right)$

13. **In a triangle ABC,** $\sin^2 A + \sin^2 B + \sin^2 C = 2$, **then the triangle is always**

1) Right angled 2) acute angle 3) Obtuse angle 4) Isosceles triangle

14. $\left(\frac{\cos A+\cos B}{\sin A-\sin B}\right)^{2021}+\left(\frac{\sin A+\sin B}{\cos A-\cos B}\right)^{2021}=$

1) 0 2) 2021 3) 2021 4) $\cot\left(\frac{A-B}{2}\right)$

15. **In** ΔABC, if $\sin A-\cos B=\cos C$ **then B=**

1) $\frac{\pi}{3}$ 2) $\frac{\pi}{2}$ 3) $\frac{\pi}{4}$ 4) $\frac{\pi}{6}$

16. **If** $\cos x+\cos y=\frac{17}{4}$ **and** $\cos x-\cos y=\frac{34}{3}$**, then** $\tan\left(\frac{x-y}{3}\right)\tan\left(\frac{x+y}{2}\right)=$

1) $\frac{3}{8}$ 2) $\frac{14}{7}$ 3) $\frac{8}{3}$ 4) $-\frac{8}{3}$

17. $\frac{\cos 6x+6\cos 4x+15\cos 2x+10}{\cos 5x+5\cos 3x+10\cos x}=$

1) $2\sin x$ 2) $2\cos x$ 3) $\cos x$ 4) $\sin x$

18. **If** $\cos A+\cos B+\cos C=0$ then $\cos 3A+\cos 3B+\cos 3C=$

1) $4\cos A\cos B\cos C$ 2) $8\cos A\cos B\cos C$ 3) $12\cos A\cos B\cos C$ 4) $10\cos A\cos B\cos C$

19. **If** $\frac{1-4\sin 10\sin 70}{2\sin 10}=k$ then $2k+3$

1) 5 2) 1 3) 2 4) $\frac{1}{2}$

20. **If** $\cos A=\frac{3}{4}$ then $32\sin\frac{A}{2}\sin\frac{5A}{2}=$

1) 10 2) 16 3) 8 4) 11

21. **The value of** $\cos^2 10°-\cos 10°\cos 50°+\cos^2 50°$ is

1) $\frac{3}{4}+\cos 20°$ 2) $\frac{3}{4}$ 3) $\frac{3}{2}$ 4) $\frac{3}{2}(1+\cos 20°)$

22. $\cos^3 110^0+\cos^3 10^0+\cos^3 130^0=$

1) $\frac{3\sqrt{3}}{8}$ 2) $\frac{\sqrt{3}}{8}$ 3) $\frac{3\sqrt{3}}{4}$ 4) $\frac{\sqrt{3}}{2}$

23. **If** $\frac{\cos x}{\cos(x-2y)}=k$, then $\tan(x-y)\tan y=$

1) $\frac{1-k}{1+k}$ 2) $\frac{1+k}{1-k}$ 3) $\frac{k}{1+k}$ 4) $\frac{k}{1-k}$

24. $\frac{\sqrt{2}-\sin\alpha-\cos\alpha}{\sin\alpha-\cos\alpha}=$

1) $\sec\left(\frac{\alpha}{2}-\frac{\pi}{8}\right)$ 2) $\tan\left(\frac{\alpha}{2}-\frac{\pi}{8}\right)$ 3) $\cot\left(\frac{\alpha}{2}-\frac{\pi}{8}\right)$ 4) $\cos\left(\frac{\pi}{2}-\frac{\alpha}{2}\right)$

25. **If** $\cos\alpha+\cos\beta=a, \sin\alpha+\sin\beta=b$ and $\alpha-\beta=2\theta$, then $\frac{\cos 3\theta}{\cos\theta}=$

1) a^2+b^2-2 2) $\frac{a^2+b^2}{4}$ 3) a^2+b^2-3 4) $3-a^2-b^2$

26. **If** $A+B+C=270^0$ then $\cos 2A+\cos 2B+\cos 2C=$

1) $1-4\cos A\cos B\cos C$ 2) $1-4\sin A\sin B\sin C$ 3) $4\sin A\sin B\sin C$ 4) $4\cos A\cos B\cos C$

27. **If** $\sin A+\sin B=\sqrt{3}(\cos B-\cos A)$ then $\sin 3A+\sin 3B=$

1) 0 2) $\sqrt{3}$ 3) 2 4) 1

28. $\cos^2 25^0 + \cos^2 95^0 + \cos^2 145^0 =$

1) $\frac{3}{2}$ 2) $\frac{2}{3}$ 3) $\frac{3}{4}$ 4) 1

29. If $A = 340^0$ then $\sqrt{1-\sin A} - \sqrt{1+\sin A} =$

1) $2\cos\frac{A}{2}$ 2) $-2\cos\frac{A}{2}$ 3) $2\sin\frac{A}{2}$ 4) $-2\sin\frac{A}{2}$

30. If $\cos\alpha = \frac{3}{5}$ and $\cos\beta = \frac{5}{13}$ then $\cos^2\left(\frac{\alpha-\beta}{2}\right) =$

1) $\frac{1}{65}$ 2) $\frac{2}{65}$ 3) $\frac{63}{65}$ 4) $\frac{64}{65}$

31. If $\tan 9\theta = \frac{3}{4}, 0 < \theta < \frac{\pi}{18}$, then the value of $3\operatorname{cosec} 3\theta - 4\sec 3\theta =$

32. The value of $\cos\frac{2\pi}{28}\operatorname{cosec}\frac{3\pi}{28} + \cos\frac{6\pi}{28}\operatorname{cosec}\frac{9\pi}{28} + \cos\frac{18\pi}{28}\operatorname{cosec}\frac{27\pi}{28}$ is

33. The value of $\left(1+\cos\frac{\pi}{9}\right)\left(1+\cos\frac{3\pi}{9}\right)\left(1+\cos\frac{5\pi}{9}\right)\left(1+\cos\frac{7\pi}{9}\right)$ **is**

34. If $\sin\theta, \cos\theta, \tan\theta$ **are in G.P then** $\cos^9\theta + \cos^6\theta + 3\cos^5\theta =$

35. The value of $\cos^6\frac{\pi}{16} + \cos^6\frac{3\pi}{16} + \cos^6\frac{5\pi}{16} + \cos^6\frac{7\pi}{16}$ **is**

36. In a ΔABC $\tan\frac{A}{2}, \tan\frac{B}{2}, \tan\frac{C}{2}$ **are in H.P. then the value of** $\cot\left(\frac{A}{2}\right).\cot\left(\frac{C}{2}\right) =$

37. If $4\cos 36^0 + \cot 7\frac{1}{2}^0 = \sqrt{n_1} + \sqrt{n_2} + ... + \sqrt{n_6}$ **, then the product of the digits in**

38. Let $0 \le A, B, C, D \le \pi$ **where B,C are not complementary such that**

$2\cos A + 6\cos B + 7\cos C + 9\cos D = 0$**,** $2\sin A - 6\sin B + 7\sin C - 9\sin D = 0$ **then** $\frac{\cos(A+D)}{\cos(B+C)} =$

39. If $\tan^2\theta = 2\tan^2\alpha + 1$, **then** $\frac{\cos 2\theta + \sin^2\alpha + 1}{2} =$

40. If $\cos\frac{\pi}{2^2}.\cos\frac{\pi}{2^3}........\cos\frac{\pi}{2^{10}}\sin\frac{\pi}{2^{10}} = k$**, then** $2^{15}k$ **is**

PERIODICITY & EXTREME VALUES

1. The period of $\cos^3 x$ **is**

1) π 2) 2π 3) $\frac{\pi}{2}$ 4) 3π

2. The period of $\sin x\cos x$ is

1) $\frac{\pi}{2}$ 2) π 3) 2π 4) $\frac{3\pi}{2}$

3. The minimum value of $4\cos\theta + 2\sqrt{3}\sin\theta$ **is**

1) $-2\sqrt{7}$ 2) $-3\sqrt{7}$ 3) $3\sqrt{7}$ 4) $2\sqrt{7}$

4. The range of $f(x) = -3\cos\sqrt{3+x+x^2}$ **is**

1) [-1,1] 2) [-2,2] 3) [-3,3] 4) [-4,4]

5. If $A = \cos\theta + 2\sqrt{2}\sin\theta$, then for all real values of "θ"

1) $-2 \le A \le 2$ 2) $-3 \le A \le 3$ 3) $-1 \le A < 1$ 4) $-2 \le A \le 3$

6. The period of $\sin\frac{\pi x}{2} + \cos\frac{\pi x}{3}$ **is**

7. Minimum value of $8\sin 4x - 15\cos 4x$ **is**

8. **Minimum value of** $4\tan x+9\cot x$ **is**

TRIGONOMETRIC EQUATIONS AND INEQUATIONS

1. **If the equation** $x^2+4+3\sin(ax+b)-2x=0$ **has atleast one real solution, where** $a,b\in[0,2\pi]$**, then one possible value of** $(a+b)$ **can be equal to**

1) $\frac{7\pi}{2}$ 2) $\frac{5\pi}{2}$ 3) $\frac{9\pi}{2}$ 4) $\frac{3\pi}{2}$

2. **If** $1+\sin\theta+\sin^2\theta+\sin^3\theta+.....\infty=4+2\sqrt{3},\ 0<\theta<\pi$**, then**

1) $\theta=\frac{\pi}{3}$ 2) $\theta=\frac{\pi}{6}$ 3) $\theta=\frac{\pi}{3}\ or\ \frac{\pi}{6}$ 4) $\theta=\frac{\pi}{3}\ or\ \frac{2\pi}{3}$

3. **If** $\frac{1}{6}\sin\theta,\cos\theta$ **and** $\tan\theta$ **are in geometric progression, then the complete solution set of** θ **is**

1) $\left\{\theta:\theta=2n\pi\pm\left(\frac{\pi}{6}\right),n\in I\right\}$ 2) $\left\{\theta:\theta=2n\pi\pm\left(\frac{\pi}{3}\right),n\in I\right\}$

3) $\left\{\theta:\theta=n\pi+(-1)^n\left(\frac{\pi}{3}\right),n\in I\right\}$ 4) $\left\{\theta:\theta=n\pi+\frac{\pi}{3},n\in I\right\}$

4. **If** $\tan(k+1)\theta=\tan\theta$, **then the set of all the value of** θ **is**

1) $\{n\pi:n\in I\}$ 2) $\left\{\frac{n\pi}{2}:n\in I\right\}$ 3) $\left\{\frac{n\pi}{k}:n\in I\right\}$ 4) $\left\{\frac{n\pi}{4}:n\in I\right\}$

5. **General solutions of the equation** $\tan^2\theta+\sec 2\theta=1$ **is**

1) $m\pi,n\pi+\frac{\pi}{3},m\in I,n\in I$ 2) $m\pi,n\pi\pm\frac{\pi}{3},m\in I,n\in I$

3) $m\pi,n\pi\pm\frac{\pi}{6},m\in I,n\in I$ 4) None of these

6. **The general solution of the system of equations**

$\sin^3 x+\sin^3\left(\frac{2\pi}{3}+x\right)+\sin^3\left(\frac{4\pi}{3}+x\right)+\frac{3}{4}\cos 2x=0$ **and** $\cos x\neq 0$ **is**

1) $x=\frac{(2k+1)\pi}{10},k\in Z$ 2) $x=\frac{(2k+1)\pi}{5},k\in Z$ 3) $x=\frac{(4k+1)\pi}{10},k\in Z$ 4) $x=\frac{(4k+1)}{5}\pi,k\in Z$

7. **The set** $\{x\in R:\cos 2x+2\cos^2 x=2\}$ **is equal to**

1) $\left\{2n\pi+\frac{\pi}{3}:n\in Z\right\}$ 2) $\left\{n\pi\pm\frac{\pi}{6}:n\in Z\right\}$ 3) $\left\{n\pi\pm\frac{\pi}{3}:n\in Z\right\}$ 4) $\left\{2n\pi-\frac{\pi}{3}:n\in Z\right\}$

8. **If the expression** $(1+\tan x+\tan^2 x)(1-\cot x+\cot^2 x)$ **is positive, then the complete set of values of x is**

1) $\left[0,\frac{\pi}{2}\right]$ 2) $[0,\pi]$ 3) $R-\left\{x=\frac{n\pi}{2},n\in I\right\}$ 4) $[0,\infty]$

9. **If x and y are the solutions of the equation** $5+8\sin^2 x=2y^2-8y+21$**, then the least possible value of** x^2y^3 **is**

1) $2\pi^2$ 2) $4\pi^2$ 3) $9\pi^2$ 4) π^2

10. **If** $\cos x-\sin x=-\frac{5}{4}$, **where** $\frac{\pi}{2}<x<\frac{3\pi}{4}$, **then** $\cot\frac{x}{2}$ **is equal to**

1) $\frac{4-\sqrt{7}}{9}$ 2) 8 3) -8 4) $\frac{4+\sqrt{7}}{9}$

11. **The number of solutions of the equation** $|\cot x| = \cot x + \operatorname{cosec} x$ **in** $[0,10\pi]$ **is/are**

1) 5　　2) 10　　3) 15　　4) 20

12. **The set of all values of a for which the equation** $\cos 2x + a\sin x = 2a - 7$ **has a solution is**

1) $(-\infty,2)$　　2) $[2,6]$　　3) $(6,\infty)$　　4) $(-\infty,\infty)$

13. **If** $\log_{\cos x}\sin x \ge 2$ **and** $0 \le x \le 3\pi$, **then the value of** $\sin x$ **lies in the interval**

1) $\left[\frac{\sqrt{5}-1}{2},1\right]$　　2) $\left(0,\frac{\sqrt{5}-1}{2}\right]$　　3) $\left[0,\frac{1}{2}\right]$　　4) None of these

14. **The number of roots of the equation** $\tan x + \sec x = 2\cos x$ **in** $[0,4\pi]$ **is**

1) 2　　2) 4　　3) 6　　4) 0

15. $\operatorname{cosec}^2\theta\left(\cos^2\theta - 3\cos\theta + 2\right) \ge 1$, **if** θ **belongs to**

1) $\left(0,\frac{\pi}{3}\right)$　　2) $\left(\frac{\pi}{2},\pi\right)$　　3) $\left(\frac{\pi}{3},\frac{\pi}{2}\right)$　　4) $\left(0,\frac{\pi}{4}\right)$

16. **Let** $f(x) = \frac{25^x}{25^x + 5}$, **then the number of solution(s) of the equation** $f\left(\sin^2\theta\right) + f\left(\cos^2\theta\right) = \tan^2\theta$, $\theta \in [0,10\pi]$ **is / are**

1) 10　　2) 2　　3) 40　　4) 20

17. **The sum of the roots of the equation** $\cos 4x + 6 = 7\cos 2x$ **in the interval [0,314] is ,** $\lambda\pi$ **then the numerical value of** λ **is**

1) 4950　　2) 2475　　3) 9900　　4) 4945

18. **If** α **and** β **are the solutions of** $\sin x = -\frac{1}{2}$ in $[0,2\pi]$ **and** α **and** γ **are the solutions of** $\cos x = -\frac{\sqrt{3}}{2}$ **in** $[0,2\pi]$, **then the value of** $\frac{\alpha+\beta}{|\beta-\gamma|}$ **is equal to**

1) 1　　2) 2　　3) 3　　4) 4

19. **If** α **and** β **are the solutions of** $\cot x = -\sqrt{3}$ in $[0,2\pi]$ **and** α **and** γ **are the solutions of** $\operatorname{cosec} x = -2$ **in** $[0,2\pi]$, **then the value of** $\frac{|\alpha-\beta|}{\beta+\gamma}$ **is equal to**

1) $\frac{1}{2}$　　2) 2　　3) $\frac{1}{3}$　　4) 3

20. **Number of root of the equation** $\cos^2 x + \frac{\sqrt{3}+1}{2}\sin x - \frac{\sqrt{3}}{4} - 1 = 0$ **which lie in the interval** $[-\pi,\pi]$ **is**

21. **The number of solution, the equation** $\sin^4 x + \cos^4 x = \sin x\cos x$ **has, in** $[\pi,5\pi]$ **is / are**

22. **The number of values of** $\theta \in \left[\frac{-3\pi}{2},\frac{4\pi}{3}\right]$ **which satisfies the system of equations** $2\sin^2\theta + \sin^2 2\theta = 2$ **and** $\sin 2\theta + \cos 2\theta = \tan\theta$ **is**

23. **Number of solutions of** $2^{\sin(|x|)} = 3^{|\cos x|}$ in $[-\pi,\pi]$, **is equal to.**

24. **Consider the equation** $\log_{\sqrt{2}\sin x}(1+cox) = 2$, $x \in \left[-\frac{\pi}{2},\frac{3\pi}{2}\right]$. **If the sum of the roots is** $\frac{p\pi}{q}$, **where G.C.D (p,q) = 1, then the value of** p^2+q^2 **is**

25. **The number of ordered pairs (x,y) satisfying the equation** $y = 2\sin x$ **and** $y = 5x^2 + 2x + 3$ **is/are**

26. **In the interval** $(0,2\pi)$**, sum of all the roots of the equation** $\sin\left(\pi\log_3\left(\frac{1}{x}\right)\right)=0$ **is**

27. **If** $0\le x\le 2\pi,$ **then the number of real values of x satisfying the equation** $81^{\sin^2 x}+81^{\cos^2 x}=30$ **is**

28. **The sum of the roots of the equation** $\left|\sqrt{3}\cos x-\sin x\right|=2$ **in** $[0,4\pi]$ **is** $k\pi$ **, then the value of 6k is**

29. **The total number of soluiton(s) of the equation** $2x+3\tan x=\frac{5\pi}{2}$ **in** $x\in[0,2\pi]$ **is/are equal to**

30. **For** $-\frac{\pi}{2}\le x\le\frac{\pi}{2}$**, the number of points of intersection of curves** $y=\cos x$ **and** $y=\sin 3x$ **is**

31. **If x and y are the solutions of the equation** $12\sin x+5\cos x=2y^2-8y+21$**, then the value of** $12\cot\left(\frac{xy}{2}\right)$ **is (Given,** $|x|<\pi$ **)**

INVERSE TRIGONOMETRIC FUNCTIONS

1. **If** $\sin^{-1}\frac{1}{3}+\sin^{-1}\frac{2}{3}=\sin^{-1}x$**, then the value of** ***x*** **is**

1) 0 2) $\frac{\left(\sqrt{5}-4\sqrt{2}\right)}{9}$ 3) $\frac{\left(\sqrt{5}+4\sqrt{2}\right)}{9}$ 4) $\frac{\pi}{2}$

2. **It** ***x*** **takes all permissible negative values, then** $\sin^{-1}x$ **is equal to**

1) $-\cos^{-1}\sqrt{1-x^2}$ 2) $\cos^{-1}\sqrt{x^2-1}$ 3) $\pi-\cos^{-1}\sqrt{1-x^2}$ 4) $\cos^{-1}\sqrt{1-x^2}$

3. **If** $\alpha=\sin^{-1}\frac{\sqrt{3}}{2}+\sin^{-1}\frac{1}{3}$ **and** $\beta=\cos^{-1}\frac{\sqrt{3}}{2}+\cos^{-1}\frac{1}{3}$**, then**

1) $\alpha>\beta$ 2) $\alpha=\beta$ 3) $\alpha<\beta$ 4) $\alpha+\beta=2\pi$

4. **The complete solution set of the inequality** $\cos^{-1}(\cos 4)>3x^2-4x$ **is**

1) $\left(0,\frac{2+\sqrt{6\pi-8}}{3}\right)$ 2) $\left(\frac{2-\sqrt{6\pi-8}}{3},0\right)$

3) (-2, 2) 4) $\left(\frac{2-\sqrt{6\pi-8}}{3},\frac{2+\sqrt{6\pi-8}}{3}\right)$

5. **The value of** $\sin\left(\cot^{-1}x\right)$ **is**

1) $\sqrt{1+x^2}$ 2) x 3) $\frac{1}{\sqrt{1+x^2}}$ 4) $\sqrt{1-x^2}$

6. **Solution set of** $\left[\sin^{-1}x\right]>\left[\cos^{-1}x\right]$**, where** $[.]$ **denotes the greatest integer function, is**

1) $\left[\frac{1}{\sqrt{2}},1\right]$ 2) $(\cos 1,\sin 1)$ 3) $[\sin 1,1]$ 4) None of these

7. **The relation** $\tan^{-1}\left(\frac{1+x}{1-x}\right)=\frac{\pi}{4}+\tan^{-1}x$ **holds true for all**

1) $x\in R$ 2) $x\in(-\infty,1)$ 3) $x\in(-1,\infty)$ 4) $x\in(-\infty,2)$

8. **The domain set of the function** $f(x)=\tan^{-1}x-\cot^{-1}x+\cos^{-1}(2-x)$ **is**

1) [0,1] 2) [-1,1] 3) [1,3] 4) None of these

9. **The value of the expression** $\cot^{-1}\frac{1}{2}+\cot^{-1}\frac{9}{2}+\cot^{-1}\frac{25}{2}+\cot^{-1}\frac{49}{2}+....$ **upto *n* terms is**

1) $\tan^{-1}2n$ 2) $\tan^{-1}(2n-1)$ 3) $\tan^{-1}n$ 4) $\tan^{-1}2n-\tan^{-1}1$

10. **The value of *a* for which** $ax^2+\sin^{-1}(x^2-2x+2)+\cos^{-1}(x^2-2x+2)=0$ **has a real solution, is**

1) $-\frac{2}{\pi}$ 2) $\frac{2}{\pi}$ 3) $-\frac{\pi}{2}$ 4) $\frac{\pi}{2}$

11. **The real solutions of the equation** $\tan^{-1}\sqrt{x(x+1)}+\sin^{-1}\sqrt{x^2+x+1}=\frac{\pi}{2}$ **are**

1) -1,0 2) 0,1 3) -1,1 4) -1,2

12. **If *x, y, z* are in arithmetic progression and** $\tan^{-1}x, \tan^{-1}y$ **and** $\tan^{-1}z$ **are also in arithmetic progression, then**

1) $x=y=z$ 2) $x=y=-z$ 3) $x=1, y=2, z=3$ 4) $x=2, y=4, z=6$

13. **Let S_1 is the complete solution set of the inequality** $\cos^{-1}(x)>\cos^{-1}(x^2)$ **and S_2 is the complete solution set of the inequality** $(\cot^{-1}x)^2-5\cot^{-1}x+6>0$**, then** $S_1\cap S_2$ **is**

1) $[-1,0)$ 2) $[\cot 3,0)$ 3) $[\cot 2,0)$ 4) $[-1,\cot 2]$

14. **Consider the function** $f(x)=\cos^{-1}([2^x])+\sin^{-1}([2^x]-1)$**, then (where** $[.]$ **represents the greatest integer part function)**

1) Domain of $f(x)$ is $x\in(-\infty,0]$ 2) Range of $f(x)$ is singleton

3) $f(x)$ is an even function 4) $f(x)$ is an odd function

15. **If** $(\cot^{-1}x)^2-7(\cot^{-1}x)+10>0$ **, then the range of *x* will be**

1) $(-\infty,\cot 2)$ 2) $(-\infty,\cot 5)$ 3) $(\cot 2,\cot 5)$ 4) $(\cot 2,\infty)$

16. **The range of the function** $f(x)=\sin^{-1}\left(\frac{x^2}{1+x^2}\right), x\in R$ **is**

1) $\left[\frac{-\pi}{2},\frac{\pi}{2}\right]$ 2) $\left[0,\frac{\pi}{2}\right)$ 3) $\left(0,\frac{\pi}{2}\right]$ 4) $\left(\frac{-\pi}{2},\frac{\pi}{2}\right)$

17. **If *x* satisfies the inequality** $(\tan^{-1}x)^2+3(\tan^{-1}x)-4>0,$ **then the complete set of values of *x* is**

1) $\left(-\tan 4,\frac{\pi}{4}\right)$ 2) $(-\infty,\tan 4)\cup\left(\frac{\pi}{4},\infty\right)$ 3) $(\tan 1,\infty)$ 4) $(\tan 4,\tan 1)$

18. **If** a_1,a_2,a_3 **are in arithmetic progression and *d* is the common difference, then** $\tan^{-1}\left(\frac{d}{1+a_1a_2}\right)+\tan^{-1}\left(\frac{d}{1+a_2a_3}\right)=$

1) $\tan^{-1}\left(\frac{2d}{1+a_1a_3}\right)$ 2) $\tan^{-1}\left(\frac{d}{1+a_1a_3}\right)$ 3) $\tan^{-1}\left(\frac{2d}{1+a_2a_3}\right)$ 4) $\tan^{-1}\left(\frac{2d}{1-a_1a_3}\right)$

19. **If** $f(x)=\tan^{-1}\sqrt{x^2+4x}+\sin^{-1}\sqrt{x^2+4x+1}$**, then**

1) domain of $f(x)$ contains 3 integers only 2) range of $f(x)$ has two elements only

3) $f(x)$ is a constant function 4) $f(x)$ contains only two elements in its domain

20. **Let** $f(x)=\sin^{-1}\left\{x\sqrt{1-x}-\sqrt{x(1-x^2)}\right\}, \forall 0\le x\le 1$**, then** $f(x)$ **is**

1) negative 2) positive 3) non-negative 4) non-positive

21. If $f(x)=\tan^{-1}\left(\frac{2^x}{1+2^{2x+1}}\right)$, then $\sum_{r=0}^{9} f(r)$ is

1) $\tan^{-1}(1024)$ 2) $\tan^{-1}\left(\frac{1023}{1024}\right)$ 3) $\tan^{-1}\left(\frac{1023}{1025}\right)$ 4) None of these

22. If $x=\sin\left(2\tan^{-1}3\right)$ and $y=\sin\left(\frac{1}{2}\tan^{-1}\frac{4}{3}\right)$, then

1) $2x=1-y$ 2) $x^2=1-2y$ 3) $x^2=1+y$ 4) $y^2=2x-1$

23. In a ΔABC, if $\angle A=\angle B=\frac{1}{2}\left(\sin^{-1}\left(\frac{\sqrt{6}+1}{2\sqrt{3}}\right)+\sin^{-1}\left(\frac{1}{\sqrt{3}}\right)\right)$ and length of the side opposite to $\angle C$ is $c=6.3^{\frac{1}{4}}$, then the area of ΔABC is

24. Let $x+\frac{1}{x}=2, y+\frac{1}{y}=-2$ and $\sin^{-1}x+\cos^{-1}y=m\pi$, then the value of m is

25. The value of *x* satisfying the equation $\sin^{-1}(1-x)-2\sin^{-1}x=\frac{\pi}{2}$ is/are

26. The value of *x* for which $\sin\left(\cot^{-1}(1+x)\right)=\cos\left(\tan^{-1}x\right)$ is

27. If the value of the expression $\tan\left(\frac{1}{2}\cos^{-1}\frac{2}{\sqrt{5}}\right)$ is in the form of $a+\sqrt{b}$ where $a,b\in Z$, then the value of $\frac{a+b}{b}$ is

28. If $f(x)=\cos^{-1}\left(x^{\frac{3}{2}}-\sqrt{1-x-x^2+x^3}\right)$, $\forall 0\le x\le 1$, then the minimum value of $f(x)$ is

29. If $\cot^{-1}\left(\frac{n}{2\pi}\right)>\frac{2\pi}{3}$, then the maximum value of the integer *n* is

30. The maximum value of *x* that satisfies the equation $\sin^{-1}\left(\frac{2\sqrt{15}}{|x|}\right)=\cos^{-1}\left(\frac{14}{|x|}\right)$ is

31. For , if $\cos^{-1}\left(\frac{7}{2}(1+\cos 2x)+\sqrt{\left(\sin^2 x-48\cos^2 x\right)}\sin x\right)=x-\cos^{-1}(k\cos x)$, then the value of *k* is equal to

PROPERTIES OF TRIANGLES

1. In a triangle ABC if $\frac{a^2+b^2}{a^2-b^2}\sin(A-B)=1$, the triangle is not right angle then $\cos(A-B)=$

1) $\sin\left(\frac{C}{2}-\frac{\pi}{4}\right)$ 2) $\cos\left(\frac{C}{2}-\frac{\pi}{4}\right)$ 3) $Tan\left(\frac{C}{2}-\frac{\pi}{4}\right)$ 4) $\cos\left(\frac{C}{2}-\frac{\pi}{4}\right)$

2. If the cosines of the angles of a triangle are proportional to opposite sides then the triangle is
1) Isosceles 2) right angled 3) Equilateral 4) Isosceles or equilateral

3. If in a triangle ABC sines of angles A and B satisfy the equation $4x^2-2\sqrt{6}x+1=0$ then $\cos(A-B)=$

1) $\frac{1}{2}$ 2) $\frac{3}{2}$ 3) 3 4) None

4. In a triangle ABC, AD is altitude from A, $b>c$ $\angle C=23^0$, $AD=\frac{abc}{b^2-c^2}$ then $\angle B=$

1) 70^0 2) 113^0 3) 123^0 4) 103^0

5. **In** $\Delta ABC\ 4\sin A=4\sin B=3\sin C$ **then** $\cos C=$

1) $\frac{1}{3}$ 2) $\frac{1}{9}$ 3) $\frac{1}{27}$ 4) $\frac{1}{18}$

6. **In** $\Delta ABC, 3\sin A == 6\sin B = 2\sqrt{3}\sin C$ **Then** $\angle A=$

1) 30^0 2) 45^0 3) 60^0 4) 90^0

7. **In** ΔABC**,** $a=5, b=4$**,** $\cos(A+B)=\frac{31}{32}$**,** $c=$

1) $\sqrt{6}$ **2) 36** **3) 6** 4) $\frac{\sqrt{319}}{2}$

8. **In** $a\Delta ABC\ (a+b+c)(b+c-a)$**=**$\lambda bc$ **Then** $\lambda\in$

1) $\lambda<0$ 2) $\lambda>0$ 3) $0<\lambda<4$ 4) $\lambda>4$

9. **The area of the** ΔABC **is** $\Delta=a^2-(b-c)^2$ **then** $Tan\left(\frac{A}{2}\right)=$

1) -1 **2) 0** 3) $\frac{1}{4}$ 4) $\frac{1}{2}$

10. **In** ΔABC **if** $\cot\frac{A}{2}:\cot\frac{B}{2}:\cot\frac{C}{2}=3:7:9$ **then** $a:b:c=$

1) 7:9:11 **2) 14:11:6** **3) 7:19:25** **4) 8:6:5**

11. **If** $\frac{2y}{5z}+\frac{2z}{5x}, \frac{2z}{5x}+\frac{2x}{5y}, \frac{2x}{5y}+\frac{2y}{5z}$ **are the sides of a triangle then** $\Delta=$

1) $\frac{4}{25}\sqrt{\frac{x}{y}+\frac{y}{z}+\frac{z}{x}}$ 2) xyz **3) 1** 4) $x+y+z$

12. **If the diameter of any ex circle of a triangle is equal to its perimeter then the triangle is**

1) Equilateral **2) Isosceles** **3) Right angled** **4) scalene**

13. **In** $\Delta ABC, \angle A=90^0$ **then** $Cos^{-1}\left(\frac{R}{r_3+r_3}\right)=$

1) 30^0 2) 60^0 3) 90^0 4) 45^0

14. **In** $\Delta ABC\ r_1=2r_2=3r_3$ **then a:b =**

1) $\frac{5}{4}$ 2) $\frac{4}{5}$ 3) $\frac{7}{6}$ 4) $\frac{6}{8}$

15. **In** ΔABC **medians** AD, BE **are draw, if** $AD=4$**,** $\angle DAB=\frac{\pi}{6}, \angle ABE=\frac{\pi}{3}$ **then area of the** $\Delta ABC=$

1) $\frac{64}{3\sqrt{3}}$ 2) $\frac{8}{3\sqrt{3}}$ 3) $\frac{16}{3\sqrt{3}}$ 4) $\frac{32}{3\sqrt{3}}$

16. **The number of triangles ABC that can be formed with** $\sin A=\frac{5}{13}, a=3, b=8$ **is**

1) 3 **2) 2** **3) 1** **4) 0**

17. **In** $\Delta ABC\ \frac{a}{\cos A}=\frac{b}{\cos B}=\frac{c}{\cos C}$**. If** $b=2$ **then area of the triangle is**

1) $\sqrt{2}$ 2) $\sqrt{3}$ **3) 2** **4) 3**

18. **In** $\Delta ABC\ r_3=r_1+r_2+r$ **then** $\angle A+\angle B=$

1) 120^0 2) 100^0 3) 90^0 4) 80^0

19. In ΔABC $r_1 = 3, r_2 = 10, r_3 = 15$ Then C=

1) 5 2) 12 3) 13 4) $\frac{13}{2}$

20. The base of a triangle is 80 and one of the base angles is 60^0. If the sum of the lengths of the other two sides is 90 then shortest sides is

1) 15 2) 17 3) 19 4) 21

21. In ΔABC, $\angle B = 60^0, \angle C = 45^0, D$ divides BC internally in 1:3 then $\frac{\sin \angle BAD}{\sin \angle CAD} =$

1) $\frac{1}{\sqrt{6}}$ 2) $\frac{1}{3}$ 3) $\frac{1}{\sqrt{3}}$ 4) $\sqrt{\frac{2}{3}}$

22. In $\Delta ABC, a = 4, b = 3, \angle A = 60^0$ then C is root of the equation.

1) $c^2 - 3c + 7 = 0$ 2) $c^2 + 3c - 7 = 0$ 3) $c^2 + 3c + 7 = 0$ 4) $c^2 - 3c - 7 = 0$

23. In $\Delta ABC, D$ is middle point of BC, if AD is perpendicular to AC then $\cos A \cos C =$

1) $\frac{2(c^2 - a^2)}{3ac}$ 2) $\frac{c^2 - a^2}{3ac}$ 3) $\frac{2(c^2 - a^2)}{ac}$ 4) $\frac{c^2 - a^2}{ac}$

24. if the angles A,B,C are in A.P then $\frac{a+c}{b} =$

1) $2\sin\left(\frac{A-C}{2}\right)$ 2) $2\cos\left(\frac{A-C}{2}\right)$ 3) $\cos\left(\frac{A-C}{2}\right)$ 4) $\sin\left(\frac{A-C}{2}\right)$

25. If $r_1^2 = r_1r_2 + r_2r_3 + r_3r_1$ then the triangle is

1) Right angled 2) Equilateral 3) Isosceles 4) None

26. If AD,BE,CF are medians of a triangle then $\frac{AD^2 + BE^2 + CF^2}{BC^2 + AC^2 + AB^2} =$

1) 4:3 2) 3:2 3) 3:4 4) 2:3

27. In ΔABC, $a = 7, b = 8, c = 9$ then the distance from the vertex B to the centroid is

1) $\frac{14}{3}$ 2) $\frac{7}{3}$ 3) 7 4) 14

28. If ΔABC $a = 4$, $b = 5$, $c = 6$ Then length of the angular bisector of C is

1) 3 2) $\frac{7}{2}$ 3) $\frac{10}{3}$ 4) $\frac{15}{4}$

29. If ΔABC $b\cos(C+\theta) + c\cos(B-\theta) =$

1) $a\sin\theta$ 2) $a\cos\theta$ 3) $a\ tan\theta$ 4) $a\cot\theta$

30. If the perimeter of a triangle is six times the A.M of the sine angles, and $a = 1$, then A=

1) $\frac{\pi}{6}$ 2) $\frac{\pi}{4}$ 3) $\frac{\pi}{3}$ 4) $\frac{\pi}{2}$

31. If ΔABC $a = 2b$ and $|A - B| = \frac{\pi}{3}$ then $C =$

1) $\frac{\pi}{6}$ 2) $\frac{\pi}{4}$ 3) $\frac{\pi}{2}$ 4) $\frac{\pi}{3}$

32. If $\Delta ABC (a+b+c)\left(Tan\frac{A}{2} + Tan\frac{B}{2}\right) =$

1) $2c\cot\left(\frac{A}{2}\right)$ 2) $2c\cot\left(\frac{B}{2}\right)$ 3) $2c\cot\left(\frac{C}{2}\right)$ 4) $2cTan\left(\frac{C}{2}\right)$

33. In a ΔABC $\left(\frac{b-c}{b+c}\right)\cot\left(\frac{A}{2}\right) + \left(\frac{b+c}{b-c}\right)Tan\left(\frac{A}{2}\right) =$

1) $2\sin(B-C)$ 2) $2\cos ec(B-C)$ 3) $2Tan(B-C)$ 4) $2\cot(B-C)$

34. **In** ΔABC $A = B - C = 60^0$ **then** $\frac{b-c}{b+c} =$

1) **1** **2)** $\frac{1}{2}$ **3)** $\frac{1}{3}$ **4)** $\frac{1}{4}$

35. **In** ΔABC **If** $C = 90^0$ **then** $R + r =$

1) $a-b$ **2)** $\frac{a+b}{2}$ **3)** $b+c$ **4)** $\frac{b+c}{2}$

36. **In the equilateral triangle** $r : R : r_1 =$

1) 1:1:1 **2)** $1:\sqrt{2}:3$ **3)** $1:2:3$ **4)** $2:\sqrt{3}:\sqrt{3}$

37. **If** $x^2+x+1, 2x+1, x^2-1$ **are the sides of a triangle then its largest angle is**

1) $\frac{\pi}{3}$ **2)** $\frac{\pi}{4}$ **3)** $\frac{\pi}{6}$ **4)** $\frac{2\pi}{3}$

38. **If** Δ **is the area of triangle whose sides are a,b,c then area of the triangle with sides** $2a, 2b, 2c$ **is**

1) 2Δ **2)** 4Δ **3)** 8Δ **4)** 16Δ

39. **In** ΔABC $\frac{s-a}{11} = \frac{s-b}{12} = \frac{s-c}{13}$ **then** $tan^2\left(\frac{A}{2}\right) =$

1) $\frac{143}{432}$ **2)** $\frac{13}{33}$ **3)** $\frac{11}{39}$ **4)** $\frac{12}{37}$

40. **In a triangle ABC if** $\sqrt{3}r + a = \sqrt{3}\ r + b = s$ **then the triangle is______**

1) Right angled **2) Isosceles** **3) Equilateral** **4) scalene**

41. $3R = 4r$ **then** $\cos A + \cos B + \cos C =$

1) 4 **2) 7** **3) 1** **4)** $\frac{7}{4}$

42. **In a triangle ABC the line joining the circumcentre to the incentre is parallel to BC then the value of** $\cos B + \cos C =$

43. **In triangle ABC,** $a \ge b \ge c$ **if** $\frac{a^3+b^3+c^3}{\sin^3 A + \sin^3 B + \sin^3 C} = 8$ **then maximum value of a is**

44. **In triangle ABC, if** $\cos A \cos B + \sin A \sin B \sin C = 1$ **and** $a:b:c = 1:1:k$ **then** $\frac{k^4+10k^2}{6} =$

45. **In triangle ABC, if** $2a^2+4b^2+c^2 = 4ab+2ac$ **and then** $8\cos B =$

46. **In triangle ABC, if** $a^4+b^4+c^4 = 2a^2b^2+b^2c^2+2c^2a^2$ **then** $2\sqrt{3}\cos A =$

47. **In triangle ABC, if** $a^2+b^2 = 101c^2$ **then** $\frac{\cot C}{10(\cot B + \cot C)} =$

48. **In triangle ABC, if** $A - B = 120^0$, $R = 8r$ **then** $8\cos C =$

49. **In triangle ABC, if** $r_1 = 3,\ r_2 = 10,\ r_3 = 15$ **then** R=

50. **In triangle ABC, if** $r + r_2 + r_3 - r_1 = 0,\ b = 5,\ c = 12$ **then a =**

51. **The tops of two poles of heights** $18m, 12m$ **are connected by a rope. If the rope makes an angle** 30^0 **with the horizontal then the length of the rope in metres is**

1) 12 **2) 18** **3)24** **4) 30**

52. **The shadow of a tower standing on a level plane is found to be** $60m$ **longer when the sun's altitude is** 30^0 **than when it is** 45^0 **then the height of the tower is**

1) $30m$ 2) $60\sqrt{3}\,m$ 3) $30\left(\sqrt{3}+1\right)m$ 4) $60m$

53. A flag staff stands vertically on a pillar. The height of the flagstaff being double the height of the pillar. A man on the ground at a distance finds both pillar and flag staff subtends equal angle θ at his eye then $\theta =$

1) $\frac{\pi}{12}$ 2) $\frac{\pi}{8}$ 3) $\frac{\pi}{10}$ 4) $\frac{\pi}{6}$

54. A tower subtends angles α,β,γ at A,B,C all lying on the horizontal line through the foot of the tower then $\frac{AB}{BC} =$

1) $\frac{\sin 3\alpha}{\sin 2\alpha}$ 2) $1+2\cot 2\alpha$ 3) $2+2\cos 2\alpha$ 4) $2\cos 2\alpha$

55. Two pillars are 120 ft apart and the height of one is double that of the other. From the middle point of the line joining their feet. An observer finds that the angular elevations of their tops are complementary. The height of the longest tower is

1) $35\sqrt{2}$ 2) $60\sqrt{2}$ 3) $50\sqrt{2}$ 4) $40\sqrt{2}$

56. A pole of height h stands at one corner of a park in the shape of an equilateral triangle. If α is the angle which the pole subtends at the mid point of the opposite side. The height of the each side of the park is

1) 2) 3) 4)

57. Three vertical poles of heights h_1,h_2,h_3 at the vertices A, B, C of triangle ABC subtend angles α,β *and* γ at the circumcenter of the triangle. If $\cot\alpha$, $\cot\beta,\cot\gamma$ are in AP then h_1,h_2,h_3 are in

1) A.P 2) G.P 3) H.P 4) A.G.P

58. A sphere of radius a'' subtends an angle 60^0 at the point a P. Then the distance of P from the centre of the sphere is

1) $\frac{a}{\sqrt{3}}$ 2) $2a$ 3) $\frac{2\sqrt{3}}{2}$ 4) $\frac{2a}{\sqrt{3}}$

59. The angle of elevation of a cloud from a point in metres above a lake is θ. The angle of depression of its reflection in the lake is 45^0. The height of the cloud is

1) $h\tan\left(45^0+\theta\right)$ 2) $h\cot\left(45^0+\theta\right)$ 3) $h\tan\left(45^0-\theta\right)$ 4) $h\tan\theta$

60. AB is a vertical pole. The end A is on the level ground. C is the mid point of AB. P is the point on the level ground. The portion CB substance an angle β at P then $\tan\beta =$

1) $\frac{n}{n^2+1}$ 2) $\frac{n}{2n^2+1}$ 3) $\frac{n}{n^2-1}$ 4) $\frac{n}{2n^2-1}$

COMPLEX NUMBERS

1. If $i=\sqrt{-1}$ and $i+i^2+i^3+.....+i^n=0$, then remainder obtained on dividing n with 4 is______

1) 0 2) 1 3) 2 4) 3

2. If $z\neq 0$ and $iz^2=\left(\bar{z}\right)^2+z$, then $|z|$=_______

1) $\sqrt{2}$ 2) $\frac{1}{\sqrt{2}}$ 3) $2\sqrt{2}$ 4) $\frac{1}{2\sqrt{2}}$

3. If $\frac{z-1}{z+1}$ is purely imaginary, then $|z|=$ _____

1) $\sqrt{2}$ 2) $2\sqrt{2}$ 3) 1 4) $\frac{1}{2}$

4. If $a+ib>c+id$, then $b+d=$____

1) 1 2) -1 3) $\frac{-1}{2}$ 4) 0

5. $A(z_1), B(z_2), C(z_3)$ are 3 points in Argand plane such that z_1, z_2, z_3 are in A.P then area of ΔABC is_______

1) $\frac{1}{\sqrt{3}}$ Sq. units 2) 0 Sq. units 3) $\frac{1}{2} Sq$ Units 4) $\frac{\sqrt{3}}{4} Sq$ units

6. Minimum value of $|z-4i|+|z-3|$ is

1) 7 2) 5 3) 2 4) 1

7. z is a complex number such that $z = \pm 1$ and $|z|=1$ then real part of $\frac{z-1}{z+1}$ is

1) 0 2) $\frac{1}{|z+1|^2}$ 3) $\frac{1}{2}$ 4) $|z+1|^2$

8. If z_1 and z_2 are non-zero complex numbers such that $|z_1, z_2|=1$ and $Arg\ z_2 = \frac{\pi}{2}$, then $\overline{z}, z_2$_____

1) 1 2) i 3) -i 4) -1

9. Let z and ω be complex numbers such that $\text{Re}\ z = |z-2|$ Re $\omega = |\omega-2|$ and $Arg\ (z-\omega) = \frac{\pi}{3}$ then $I_m(z+w) =$__________

1) $\frac{1}{\sqrt{3}}$ 2) $\frac{2}{\sqrt{3}}$ 3) $\sqrt{3}$ 4) $\frac{4}{\sqrt{3}}$

10. Let $z = x+iy$ (x, y are integers) The area of the rectangle whose vertices are the roots of the equation $\overline{z}\, z^3 + z\, \overline{z}^3 = 350$ is_____Square units

1) 32 2) 40 3) 48 4) 80

11. If $ab = 1+\sqrt{1-b^2}$ and $z = e^{i\theta}$, then $\frac{b}{2a}(1+az)\left(1+\frac{a}{z}\right) =$

1) $1-b\cos\theta$ 2) $1+b\cos\theta$ 3) $b\sin\theta$ 4) $1-b\sin\theta$

12. If $|z-2i| \le \sqrt{2}$ then the maximum value of $|3-i(z-1)|$ is

1) $\sqrt{2}$ 2) $2\sqrt{2}$ 3) $2+\sqrt{2}$ 4) $3+2\sqrt{2}$

13. If $z(1+a) = b+ic$ and $a^2+b^2+c^2=1$, Then $\frac{1+iz}{1-iz}$ =__________

1) $\frac{a+ic}{1+b}$ 2) $\frac{a+ib}{1+a}$ 3) $\frac{b-ic}{1+c}$ 4) $\frac{b+ic}{1+a}$

14. If z_1, z_2, z_3 are points A, B, C in argand plane and $(z_1-z_2)^2+(z_2-z_3)^2+(z_3-z_1)^2=0$, then

1) $z_1 = z_2 = z_3$ 2) $|z_1|=|z_2|=|z_3|$

3) Arg $z_1 = Arg\ z_2 = Arg\ z_3$ 4) $|z_1-z_2|=|z_2-z_3|=|z_3-z_1|$

15. The least positive argument of z, If $|z-1-2i| \le 1$ is__________

1) $\tan^{-1}\left(\frac{1}{2}\right)$ 2) $\tan^{-1}\left(\frac{2}{3}\right)$ 3) $\tan^{-1}\left(\frac{3}{4}\right)$ 4) $\frac{\pi}{6}$

16. Reflection of the complex number $\frac{2+i}{3-i}$ with respect to the straight line $(1+i)z = (1-i)\overline{z}$

1) $\frac{2+i}{3-i}$ 2) $\frac{-2+i}{-3+i}$ 3) $\frac{2-i}{3-i}$ 4) $\frac{2+i}{-3+i}$

17. z **is a complex number such that** $\left|5z+\frac{1}{z}\right|=3$ **and** $Arg\ z=\theta$ **then maximum value of** $\cos 2\theta$ **is_____**

1) $\frac{-1}{10}$ 2) $\frac{1}{10}$ 3) $\frac{1}{20}$ 4) $\frac{-1}{20}$

18. **Let z be a complex number such that** $\left|z-\frac{6}{z}\right|=5$ **then maximum value of** $|z|$ **will be___**

1) 2 2) 3 3) 5 4) 6

19. **Let a,b,c be complex numbers on the unit circle** $|z|=1$ **such that** $abc=a+b+c$ **then** $|ab+bc+ca|=$ **______**

1) 3 2) 6 3) 1 4) 2

20. **The sum of all real values of** x **in the interval** $[0,2\pi]$ **for which the expression** $\frac{\sin\frac{x}{2}+\cos\frac{x}{2}+i\tan x}{1+2i\sin\frac{x}{2}}$ **is purely real is______**

1) $\frac{9\pi}{2}$ 2) $\frac{9\pi}{4}$ 3) $\frac{7\pi}{2}$ 4) $\frac{13\pi}{4}$

21. **If the circles** $z\bar{z}+\bar{a}z+a\bar{z}+b=0$ **and** $z\bar{z}+\bar{c}z+c\bar{z}+d=0$ **(Where** $b,d\in R$**) cut Orthogonally, then** $\text{Re}(a\bar{c})=$ **_____**

1) $b+d$ 2) $b-d$ 3) $\frac{b+d}{2}$ 4) $\frac{|b-d|}{2}$

22. **If** z **lies in** 4^{th} **quadrant then Arg** $\left(\frac{\bar{z}-z}{2021}\right)=$ **___**

1) 0 2) $\frac{\pi}{2}$ 3) $\frac{-\pi}{2}$ 4) π

23. **If** $z=x+iy$ **and** $\operatorname{cosec}^{-1}\left(\frac{z}{1+i}\right)$ **be defined then**

1) **Z lies in** 1^{st} or 3^{rd} **quadrants**
2) **Z lies on** 2^{nd} or 4^{th} **quadrants**
3) **Z lies on real axis**
4) **Z lies on imaginary axis**

24. $P(z_1)$ and $Q(z_2)$ **Are 2 points in argand plane such that** $|z_1|=|z_2|$ **and** $\angle POQ=\frac{\pi}{3}$ **then** $z_1^3+z_2^3=$ **______**

1) **A positive integer**
2) **Proper fraction**
3) **Zero**
4) **Fractional number**

25. **If** $|z_1|=|z_2|=|z_3|=1$ **and** $z_1+z_2+z_3=0$ **then the area of the triangle whose vertices are** z_1,z_2,z_3 **is ______square units**

1) $\frac{3\sqrt{3}}{4}$ 2) $\frac{\sqrt{3}}{4}$ 3) 1 4) 2

26. **If** $|z_1|=|z_2|=|z_3|=1$ **and** $z_1+z_2+z_3=\sqrt{2}+i$ **then the number** $z_1\bar{z}_2+z_2\bar{z}_3+z_3\bar{z}$**, is___**

1) **a positive real number**
2) **a negative real number**
3) **Always zero**
4) **Purely imaginary number**

27. **Number of values of** z **satisfying** $|z-2i|=2$ **and** $z(1-i)-\bar{z}(1+i)=4i$ **simultaneously is______**

1) 0 2) 2 3) 3 4) 4

28. **Minimum value of the expression** $E=|z|^2+|z-3|^2+|z-6i|^2$

1) $15\sqrt{2}$ 2) 25 3) 30 4) $5\sqrt{3}$

29. $E=|z|^2+|z-3|^2+|z-6i|^2$ **assumes minimum value when** $z=$_____

1) $1+2i$ 2) $2+i$ 3) $-1+2i$ 4) $2-i$

30. If $|z+z_2|^2=|z_1|^2+|z_2|^2$ **then** $\frac{z_1}{z_2}$ *is* ______

1) Purely imaginary 2) Purely real 3) Real and positive 4) does not exist

31. If a complex number z satisfies $|z|^2+\frac{4}{|z|^2}-2\left(\frac{z}{\bar{z}}+\frac{\bar{z}}{z}\right)-16=0$ **then the maximum value of** $|z|$ **is___**

1) $\sqrt{6}+1$ 2) 4 3) $2+\sqrt{6}$ 4) 6

32. If $z,-z$ **and** $1-z$ **are the vertices of an equilateral triangle then** $\text{Re}(z)=?$

1) 1 2) $\frac{1}{2}$ 3) $\frac{1}{3}$ 4) $\frac{1}{4}$

33. If four complex numbers $z,\bar{z},\bar{z}-2\text{Re}(\bar{z}),z-2\text{Re}(z)$ **represent the vertices of the square of the side 4 units in the argand plane, then** $|z|=$_______

1) 2 2) 4 3) $4\sqrt{2}$ 4) $2\sqrt{2}$

34. The centre of the square ABCD is given if A is z **, then centroid of** ΔABC **is_____**

1) $\frac{z}{3}$ 2) $\pm\frac{iz}{3}$ 3) $\pm\frac{z}{3}$ 4) $\pm\frac{iz}{2}$

35. $A(z_1),B(z_2),C(z_3)$ **are vertices of a right angled isosceles triangle, right angle at A and** $z_3=\alpha z_1+\beta z_2$ **then** $|\alpha|+|\beta|=$____

1) 1 2) $\sqrt{2}-1$ 3) $\sqrt{2}+1$ 4) 2

36. z_1 **And** z_2 **are two unimodular complex numbers and** $A=\begin{bmatrix}\bar{z}_1 & -z_2\\ \bar{z}_2 & z_1\end{bmatrix}$ *and* $B=\begin{bmatrix}z_1 & z_2\\ -\bar{z}_2 & \bar{z}_1\end{bmatrix}$**,then** $A^{-1}B^{-1}$ **is equal to___**

1) $\begin{bmatrix}z_1 & z_2\\ \bar{z}_1 & \bar{z}_2\end{bmatrix}$ 2) $\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$ 3) $\begin{bmatrix}1/2 & 0\\ 0 & 1/2\end{bmatrix}$ 4) $\begin{bmatrix}2 & 0\\ 0 & 2\end{bmatrix}$

37. If $|z-2-i|=|z|\sin\left(\frac{\pi}{4}-Arg\ z\right)$ **then locus of** z **is**

1) Parabola 2) ellipse 3) Circle 4) Pair of lines

38. Let $A(z_1),B(z_2)$ **be two points in argand plane and** z_1,z_2 **are roots of the equation** $z^2+pz+q=0$ **(Where p, q are complex numbers) If** $OA=OB$ **and** $\angle AOB=\alpha$**, where O is origin, then** $p^2=$____

1) $4q^2\cos^2\left(\frac{\alpha}{2}\right)$ 2) $4q\cos^2\left(\frac{\alpha}{2}\right)$ 3) $4q\cos\left(\frac{\alpha}{2}\right)$ 4) $2q\cos\left(\frac{\alpha}{2}\right)$

39. If $\cos\alpha+2\cos\beta+3\cos\gamma=0=\sin\alpha+2\sin\beta+3\sin\gamma$ **then the value of** $\sin 3\alpha+8\sin 3\beta+27\sin 3\gamma$ **is_____**

1) $\sin(\alpha+\beta+\gamma)$ 2) $3\sin(\alpha+\beta+\gamma)$ 3) $\sin(\alpha+2\beta+3\gamma)$ 4) $18\sin(\alpha+\beta+\gamma)$

40. If $z_n=cis\left(\frac{\pi}{(2n+1)(2n+3)}\right)$ **then** $\lim_{n\to\infty}(z_1z_2z_3........z_n)$ **is**

1) $cis\frac{\pi}{3}$ 2) $cis\frac{\pi}{6}$ 3) $cis\frac{5\pi}{6}$ 4) $cis\left(\frac{-\pi}{6}\right)$

41. **If** $1,\alpha,\alpha_2,\alpha_2..........\alpha_{2020}$ **are** $(2021)^{th}$ **roots of unity, then the value of** $\sum_{r=1}^{2020} r(\alpha_r+\alpha_{2021-r})$ **is equal to**

1) -2021 **2) 2021** **3) -2020** **4) 2020**

42. **If** $\alpha=\cos\frac{2\pi}{7}+i\sin\frac{2\pi}{7}, a=\alpha+\alpha^2+\alpha^4$ **and** $b=\alpha^3+\alpha^5+\alpha^6$ **then** $|(a+b)+abi|=$ ___

1) $\sqrt{3}$ **2)** $\sqrt{5}$ **3)** $\sqrt{6}$ **4)** 2

43. $\sum_{k=1}^{100}\left(i^{k!}+\omega^{k!}\right)$ **simplifies to_** $\left(where\ i=\sqrt{-1}, \omega=\frac{-1}{2}+\frac{i\sqrt{3}}{2}\right)$

1) $190+\omega$ **2)** $192+\omega^2$ **3)** $190+i$ **4)** $192+i$

44. **If** $s_n=2(\omega+1)(\omega^2+1)+3(2\omega+1)(2\omega^2+1)+4(3\omega+1)(3\omega^2+1)+$**........to n terms. Then unit's digit in** S_{24} **is____**

1) 1 **2) 0** **3) 3** **4) 4**

45. **If a, b, c are integers, not all equal and** ω **is a cube root of unity** $(\omega\neq 1)$ **then minimum value of** $|a+b\omega+c\omega^2|$ **is______**

1) 0 **2) 1** **3) 2** **4) 3**

46. **The least positive argument of z satisfying** $z^{12}+9z^6-400=0$ **is** θ**,then the value of** $4\cos^2\theta$ **is____**

1) 1 **2) 2** **3) 3** **4) 4**

47. **If** $\alpha\neq 1$ **and** $\alpha^5=1$ **then** $\log_{\sqrt{3}}\left|1+\alpha+\alpha^2+\alpha^3-\frac{2}{\alpha}\right|$ **is____**

1) 2 **2) 3** **3) 4** **4)** $\frac{1}{2}$

48. **If** $p=a+b\omega+c\omega^2, q=b+c\omega+a\omega^2$**,** $r=c+a\omega+b\omega^2$ **(where a,b,c are non-zero) and** ω **is a cube root of unity** $(\omega\neq 1)$ **then** $p^2+q^2+r^2=$ ___

1) 0 **2) 1** **3) 3** **4) 2**

49. **let** $\alpha=cis\frac{2\pi}{11}, \lambda=\alpha^6$ **then** $\mathrm{Re}\left(\lambda+\lambda^2+\lambda^3+\lambda^4+\lambda^5\right)$ **is______**

1) 0 **2)** $\frac{-1}{2}$ **3)** $\frac{+1}{2}$ **4)-1**

50. **If** $z+\frac{1}{z}=\sqrt{3}$ **then the value of** $\sum_{r=1}^{5}\left(z^r+\frac{1}{z^r}\right)^2$ **is________**

1) 14 **2) 27** **3) 8** **4) 18**

51. **If** $\left(\frac{1+i}{1-i}\right)^{m/2}=\left(\frac{1+i}{1-i}\right)^{n/3}=1(m,n\in N)$**; then G.C.D (*m*,*n*) = ____**

52. **Let** $u=\frac{2z+i}{z-ki}, z=x+iy$ **and** $k>0$**. If the curve represented by** $\mathrm{Re}(u)+\mathrm{Im}(u)=1$ **intersects y-axis at P,Q and PQ = 5; then the value of *k* is ____**

53. **Let Z be a complex number such that** $\left|\frac{z-i}{z+2i}\right|=1$ **and** $|z|=\frac{5}{2}$**, then the value of** $|z+3i|$ **is ____**

54. **Z is a complex number such that** $\mathrm{Im}(z)=164$ **and *h* is a positive integer such that** $\frac{z}{z+n}=4i$**, then *n* =____**

55. **Minimum value of** $\frac{\operatorname{Im} z^5}{(\operatorname{Im} z)^5}$ **is** _____

56. **Z is a complex number (non real) such that** $\frac{1+z+z^2}{1-z+z^2}$ **is real, then** $|z| =$ ____

57. **Let** $z = 18+26i$ **is such that** $z_0 = x_0 + iy_0$ **is cube root of z having least positive argument, then** $\frac{x_0^{\ 3} + y_0^{\ 3}}{5} =$ ____

58. **If** ω **is any complex number such that** $z\omega = |z|^2$ **and** $|z-\bar{z}| + |\omega + \bar{\omega}| = 4$ **, then area bounded by locus of** z **is ____ sq units**

59. **If** $f(x) = ax^2 + bx$ **and** $f(1) = 2, f(i^2) = 0$**, then sum of roots of** $f\left(z + \frac{1}{z}\right) = 0$ **is** ____

60. **If** $x = i\left(i + \sqrt{2}\right)$**, then** $x^4 + 4x^3 + 6x^2 + 4x + 3 =$ ____

61. $A(z_1), B(z_2), C(z_3)$ **and** $D(z_4)$ **are vertices of a square such that** $|z_1 - 1| = |z_2 - 1| = |z_3 - 1| = |z_4 - 1|$ **then** $z_1 + z_2 + z_3 + z_4$ **is** ____

62. **If the origin and non-real roots of** $2z^2 + 2z + \lambda = 0$ **(where** $\lambda \in R$ **) form the 3 vertices of an equilateral triangle, then** $\frac{1}{\lambda} =$ ____

63. **Number of complex numbers z, satisfying** $|z| = 1$ **and** $\left|\frac{z}{\bar{z}} + \frac{\bar{z}}{z}\right| = 1$ **is** ___

64. **When the polynomial** $5x^3 + Mx + N$ **is divided by** $x^2 + x + 1$ **gives 0 as remainder, then the value of** $M + N$ **is** __

65. **Let** z **be a complex number such that** $z^7 = 1(z \neq 1)$ **then the value of**

$$z^{100} + \frac{1}{z^{100}} + z^{300} + \frac{1}{z^{300}} + z^{500} + \frac{1}{z^{500}} = \_\_\_$$

66. **If** $z_i\ (i = 1,2,3,....,50)$ **are roots of the equation** $\sum_{r=0}^{50} z^r = 0$**, then value of** $\sum_{r=0}^{50} \frac{1}{z_r - 1}$ **is** __

67. **If** ***a*** **and** ***b*** **are real numbers such that** $(z+\alpha)^4 = a + b\alpha$**, where** $\alpha = \frac{-1+i\sqrt{3}}{2}$ **, then** $(a+b)$ **=**___

68. **Let** $w(\neq 1)$ **be a cube root of unity and S be the set of all non-singular matrix of the form**

$$\begin{bmatrix} 1 & a & b \\ \omega & 1 & c \\ \omega^2 & \omega & 1 \end{bmatrix}$$

, where $a, b, c \in \{\omega, \omega^2\}$ **, then the n** ω **of distinct matrices in set S are** __

69. **If** $x^2 - ix + 1 = 0$**, then** $x^{10} + \frac{1}{x^{10}} =$ ___

70. **If** $|z| = r$ **and** z_1, z_2 **are the roots of the equation** $z^2 + |z|z + z\bar{z} = 0$ **and** $|z_1 - z_2| = \lambda r^2$ **, then** $\lambda =$ ___