Time : 3 Hr. - ((0 $, 1 6 7 (6 7 6 (5 , (6 **Time:**
Marks:

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1. If $a\sin^2x + b\cos^2x = c$, $b\sin^2y + a\cos^2y = d$ and $a\tan x = b\tan y$ then $\frac{a^2}{b^2} =$

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

2. If $a\sin^3x + b\cos^3x = \sin x.\cos x$ and $a\sin x = b\cos x$ then $a^2 + b^2 =$

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

3. If $\frac{\cos A}{\cos B} = n$, *and* $\frac{\sin A}{\sin B} = m$ then $(m^2 - n^2)\sin^2B =$

   1) $(1 - n^2)$ 2) $1 + n^2$ 3) $1 - n$ 4) $1 + n$

4. If $\tan A = \frac{x\sin B}{1 - x\cos B}$, *and* $\tan B = \frac{y\sin A}{1 - y\cos A}$ *then* $\frac{\sin A}{\sin B} =$

   1) x/y 2) y/x 3) x + y 4) x – y

5. If $\cos(\theta - \alpha) = a$ and $\cos(\theta - \beta) = b$ 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) $-a^2 - b^2$

6. If $f\left(\frac{2\tan x}{1+\tan^2 x}\right) = \frac{(\cos 2x + 1)(\sec^2 x + 2\tan x)}{2}$ then f(4) =

   1) 1 2) 3 3) 0 4) 5

7. If $f_n(x) = \frac{\sin x}{\cos 3x} + \frac{\sin 3x}{\cos 3^2 x} + \frac{\sin 3^2 x}{\cos 3^3 x} + \ldots + \frac{\sin 3^{n-1} x}{\cos 3^n x}$ then $f_2\left(\frac{\pi}{4}\right) + f_3\left(\frac{\pi}{4}\right) =$

   1) 0 2) 1 3) –1 4) 2

8. If $\cos(\theta - \alpha)$, $\cos\theta$, $\cos(\theta + \alpha)$ are in H.P. then $\cos\theta.\sec(\alpha/2) =$

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

9. If $\cos x + \cos y + \cos z = 0$ and $\sin x + \sin y + \sin z = 0$ then $\cos^2\left(\frac{x-y}{2}\right) =$

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

10. If $x = \sin\alpha + \sin\beta$, $y = \cos\alpha + \cos\beta$, then $\tan\alpha + \tan\beta =$

    1) $\frac{8xyz}{2\left(y^2 - x^2\right) + \left(x^2 + y^2\right)\left(x^2 + y^2 - 2\right)}$ 2) $\frac{4xy}{\left(y^2 - x^2\right) + \left(x^2 + y^2\right)\left(x^2 + y^2 - 2\right)}$

    3) $\frac{8xy}{\left(x^2 + y^2\right)\left(x^2 + y^2 - 2\right)}$ 4) 4xy

11. If $f(n) = 2\cos nx \;\; \forall\, n \in N$ then $f(1)\, f(n + 1) - f(n) =$

    1) f(n + 3) 2) f(n + 2) 3) f(n +1)f(2) 4) f(n +2)f(2)

12. Let $f(x) = \frac{\sin 2nx}{1 + \cos^2 nx}, n \in N,$ has $\pi/6$ as a fundamental period, then n =

    1) 2 2) 3 3) 6 4) 8

13. The ratio of the greatest value of $2 - \cos x + \sin^2 x$ to its least value is

    1) 9 : 4 2) 1 : 4 3) 13 : 4 4) 3 : 8

14. If tanx + 2tan2x + 4 tan4x+ 8cot8x = $\sqrt{3}$ then the general solution of 'x' is

1) $n\pi+\frac{\pi}{3},\forall n\in Z$ 2) $n\pi+\frac{\pi}{6},\forall n\in Z$ 3) $n\pi+\frac{\pi}{4},\forall n\in Z$ 4) $n\pi,\ \forall n\in Z$

15. Number of solutions of the equation tanx + secx = 2 cosx in the interval [0, 2π] is

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

16. The most general value of 'θ' for which sinθ – cosθ = $\min_{a\in R}\{1,\ a^2-6a+11\}$ are given by

1) $n\pi+(-1)^n\frac{\pi}{4}-\frac{\pi}{4},n\in Z$ 2) $n\pi+(-1)^n\frac{\pi}{4}+\frac{\pi}{4},n\in Z$ 3) $2n\pi+\frac{\pi}{4},n\in Z$ 4) $n\pi+\frac{\pi}{2},n\in Z$

17. Let $2\sin^2x + 3\sin x - 2 > 0$ and $x^2 - x - 2 < 0$, 'x' measured in radians. Then x lies in the interval

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

18. If $0 \le x \le 2\pi$ and $|\cos x| \le \sin x$ then

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

19. If $2\tan^2x - 5\sec x = 1$ for exactly 7 distinct values of $x \in [0, n\pi/2]$, $n\in N$, then the greatest value of 'n' is

1) 13 2) 17 3) 19 4) 15

20. The number of solutions of $\sum_{r=1}^{5}\cos rx = 5$ in the interval [0, 2π] is

1) 0 2) 1 3) 5 4) 2

21. The trigonometric equation $\sin^{-1}x = 2\sin^{-1}a$ has a solution for

1) $|a| \le \frac{1}{\sqrt{2}}$ 2) $a\in R$ 3) $|a| < \frac{1}{2}$ 4) $|a| \ge \frac{1}{\sqrt{2}}$

22. If $n\in N$, $\sum_{k=1}^{n}\sin^{-1}(x_k)=\frac{n\pi}{2}$ *then* $\sum_{k=1}^{n}x_k$ =

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

23. If $x = \tan^{-1}(1) + \cos^{-1}(-1/2) + \sin^{-1}(-1/2)$ and $y=\cos\left[\frac{1}{2}\cos^{-1}\left(\frac{1}{8}\right)\right]$ then

1) x = 2πy 2) y = 3πx 3) x = πy 4) y = πx

24. If $x(3 - x) \ge 2$ then $\sin^{-1}x + \sin^{-1}(x^2) + \sin^{-1}(x^3) + \sin^{-1}(x^4) + \ldots + \sin^{-1}(x^{10}) =$

1) π/2 2) 2π 3) 5π 4) 10π

25. Sum of infinite terms of the series $\cot^{-1}\left(1^2+\frac{3}{4}\right)+\cot^{-1}\left(2^2+\frac{3}{4}\right)+\cot^{-1}\left(3^2+\frac{3}{4}\right)+\ldots..\infty$ is

1) π/4 2) $\tan^{-1}2$ 3) $\tan^{-1}3$ 4) $\tan^{-1}4$

26. If a sinx = b cosx = $\frac{2c\tan x}{1-\tan^2 x}$ and $(a^2 - b^2)^2 = kc^2(a^2 + b^2)$ then k =

27. The minimum value of $\sqrt{(3\sin x-4\cos x-10)(3\sin x+4\cos x-10)}$ is

28. The number of solutions of $\sec x \cos 5x + 1 = 0$ where $0 < x \le \pi/2$ is

29. If $\cot^{-1}\left(\frac{n^2-10n+26}{2\sqrt{3}}\right)>\frac{\pi}{6},\ n\in N,$ then the minimum value of 'n' is

30. If the range of the function $f(x) = \sin^{-1}x + 2\tan^{-1}x + x^2 + 4x + 1$ is [p, q] then the value of (p + q) is

31. The value of $\sin^{-1}(\cos 2) - \cos^{-1}(\sin 2) + \tan^{-1}(\cot 4) - \cot^{-1}(\tan 4) + \sec^{-1}(\operatorname{cosec} 6) - \operatorname{cosec}^{-1}(\sec 6)$ =

1) 0 2) 3π 3) $5\pi - 16$ 4) $8 - 3\pi$

32. A flagstaff of the height (a–b) stands on the top of a tower subtends the same angle at the point on the horizontal plane through the foot of the tower which are at a distance 'a' and 'b' from the tower. The height of the tower is

1) b 2) a + b 3) a 4) a – b

33. A tower ABCD stands on a level ground with foot A. At a point 'P' on the ground the portion AB,AC and AD subtends angles α, β, γ respectively. If AB = a, AC = b, AD = c, AP = x and $\alpha + \beta + \gamma = 180^0$ then $(a + b + c)x^2$ =

1) abc 2) a + b + c 3) a + b – c 4) a – b – c

34. ABCD is a trapezium such that AB and CD are parallel and BC perpendicular CD. If $\angle ADB = \theta$, BC = p and CD = q then AB =

1) $\frac{(p^2+q^2)\sin\theta}{p\cos\theta+q\sin\theta}$ 2) $\frac{p^2+q^2\cos\theta}{p\cos\theta+q\sin\theta}$ 3) $\frac{(p^2+q^2)}{p\cos\theta+q\sin\theta}$ 4) $\frac{p^2+q^2\sin\theta}{p\cos\theta+q\sin\theta}$

35. If x is an acute angle and $y = \log_e\left[\tan\left(\frac{\pi}{4}+\frac{x}{2}\right)\right]$ then cosx coshy =

1) 0 2) –1 3) 1 4) 2

36. The value of $\tan\left[i\log\left(\frac{p-iq}{p+iq}\right)\right]$ is

1) $\frac{pq}{p^2+q^2}$ 2) $\frac{pq}{p^2-q^2}$ 3) $\frac{2pq}{p^2-q^2}$ 4) $\frac{2pq}{p^2+q^2}$

37. Real part of $\cosh(\alpha + i\beta)$ is

1) cos hα cosβ 2) Cosα cosβ 3) Cosα coshβ 4) Sinα sinhβ

38. Negation of $p \vee (\sim p \wedge q)$ is equivalent to

1) $\sim (p \wedge q)$ 2) $\sim p \wedge \sim q$ 3) $p \wedge \sim q$ 4) $\sim p \wedge q$

39. Consider the statements

P : If 8 is lessthan 6 then 2 + 2 = 5

Q : if $\sqrt{2}$ is irrational then $\sqrt{2}+1$ is rational

Then truth values of P and Q are respectively

1) T, F 2) F, T 3) T, T 4) F, F

40. Converse of the statement P : If n is positive then n^2 is positive

1) If n^2 is positive then n is negative 2) If n^2 is not positive then n is not positive

3) If n^2 is positive then n is positive 4) If n is negative then n^2 is positive

THE END