1. If the line $y = x\sqrt{3}$ cuts the curve $x^3 + y^3 + 3xy + 5x^2 + 3y^2 + 4x + 5y - 1 = 0$, at the points A, B and C, then $OA.OB.OC$ is equal to (where 'O' is origin)

(A) $\frac{4}{13}(3\sqrt{3}-1)$ (B) $3\sqrt{3}+1$

(C) $\frac{1}{\sqrt{3}}(2+7\sqrt{3})$ (D) none of these

2. If $\int f(x)dx = g(x)$, then $\int f^{-1}(x)dx$ is equal to

(A) $g^{-1}(x)+c$

(B) $xf^{-1}(x)-g(f^{-1}(x))+c$

(C) $xf^{-1}(x)-g^{-1}(x)+c$

(D) $f^{-1}(x)+c$

3. A coin is tossed until head appears or the coin has been tossed thrice. Given hat head does not appear on the first toss, then the probability that the coin is tossed thrice is

(A) $\frac{1}{2}$ (B) $\frac{1}{4}$ (C) $\frac{3}{4}$ (D) $\frac{3}{8}$

4. Let $f(x) = 1 + 3x^2 + 3^2x^4 + 3^3x^6 + ... + 3^{30}x^{60}$, then $f(x)$ has

(A) at leat one local maximum
(B) exactly one local maximum
(C) at least one local minimum and one local maximum
(D) exactly one local minimum

5. Number of integral solutions of the equation

$$3\tan^{-1}x + \cos^{-1}\left(\frac{1-3x^2}{\left(1+x^2\right)^{3/2}}\right) = 0,$$ is

(a) 1 (b) 2 (c) 0 (d) infinite

6. If K is a point on the axis of parabola $y^2 = 4x$ such that for every chord PQ of the parabola drawn through K, $\frac{1}{PK^2}+\frac{1}{QK^2}$ is independent of slope of slope of the chord, then the coordinates of K are

(a) (1, 0) (b) (2, 0) (c) (3, 0) (d) (4, 0)

7. Which one of the following is / are true

(A) A is a non-singular square matrix of order $n \times n$ and k is a scalar, then $|adj\,(KA)|$ is equal to $K^{n^2-n}\,|A|^{n-1}$

(B) If $|A| = 0$ and $adj\,A.B = O$, then system of equation $AX = B$ has infinitely many solutions. Here A is matrix of order 3×3, $X = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$ and B is matrix of order 3×1.

(C) A & B are two square matrices of order $n \times n$ such that AB = O and A is non-singular, then B must be null matrix.

(D) If AB is non-singular, then A and B both must be non-singular.

8. Let $x^5 - x^3 + x = \lambda$, then

(A) $x^6 \geq 2\lambda - 1$ FOR $x < 0$

(B) $x^6 \geq 2\lambda - 1$ FOR $x > 0$

(c) $x^6 \leq 2\lambda - 1$ FOR $x < 0$

(D) $x^6 \leq 2\lambda - 1$ FOR $x \in R$

9. Locus of the centre of a circle touching a given circle and a given straight line is the parabola $y^2 = 8x$. Then

(A) Centre of the given circle is (2, 0)
(B) If radius of the given circle is 2 units then given line must be the directrix of $y^2 = 8x$
(C) If radius of the given circle is 2 units then given line must be the tangent to the circle
(D) Centre of the given circle is (4, 0)

10. If $f(x)=\sin\left\{[x+5]+\left\{x-\left\{x-\{x\}\right\}\right\}\right\}$ is a function for $x\in\left(0,\frac{\pi}{2}\right]$, where {.} and [.] represent fractional part and greatest integer functions respectively, then range of $f(x)$ is

(A) $[0,\sin 1)$

(B) $(0,\sin 1)\cup[0,\cos 1)$

(C) $[0,\sin 1)\cup(0,\cos 1)$

(D) $[0,\cos 1)$

11. The angles α,β,γ of a triangle are in A.P. If the greatest angle γ is double the least angle α, then

(A) $\alpha:\beta=2:3$ (B) $\alpha:\gamma=1:2$

(C) $\beta:\gamma=3:4$ (D) $\gamma:\alpha=2:1$

Paragraph for Ques nos. 12 to 14

In a group of children, 45 play football, out of which 30 play football only; 28 play hockey; 25play cricket, out of which 11 play cricket only, further 7 play cricket and football but not hockey; 5 play football and hockey but not cricket and 19 play atleast two of he three games. Further each child in the group play at least one of the three games.

12. The Total number of children in the group is

(A) less than 58 (B) less than 76

(C) greater than 76 (D) between 70 and 80

13. The number of ways of selecting a cricket team of 11 players

(A) ${}^{25}C_{11}$ (B) ${}^{20}C_{11}$

(C) ${}^{18}C_{11}$ (D) none of these

14. If two children selected at random are found to play both cricket and hockey, what is the probability that they does not play football.

(A) $\frac{1}{7}$ (B) $\frac{1}{2}$ (C) $\frac{2}{7}$ (D) $\frac{5}{7}$

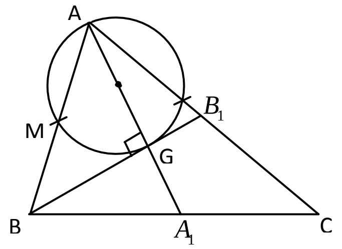
15. Match the following:

Column – I	Column -II
(A) If the line $\frac{x-1}{1}=\frac{y+1}{-2}=\frac{z+1}{\lambda}$ lies in the plane 3x – 2y + 5z = 0, then λ is equal to	(p) $\sin^{-1}\sqrt{\frac{6}{25}}$
(B) If $(3,\lambda,\mu)$ is a point on the line 2x + y + z – 3 = 0 = x – 2y +z – 1, then $\lambda+\mu$ is equal to	(q) $-\frac{7}{5}$
(C) The angle between the line x = y =z and the plane 4x – 3y + 5z = 2 is	(r) -3
(D) The angle between the planes x + y + z = 0 and 3x – 4y + 5z = 0 is	(s) $\cos^{-1}\sqrt{\frac{8}{75}}$
	(t) $\cos^{-1}\sqrt{\frac{57}{75}}$
	(u) $\sin^{-1}\sqrt{\frac{67}{75}}$

16. A curve passes through (2, 0) and the slope of the tangent at any point (x,y) is x^2-2x for all values of x. The point of minimum ordinate on the curve where $x>0$ is (a,b), then find the value of $a+6b$.

17. If $f(x)=ae^{2x}+be^{x}+cx$ satisfies the condition $f(0)=-1,\ f'(\log 2)=31$ and $\int_0^{\ln 4}(f(x)-cx)\,dx=\frac{39}{2}$, then find the value of $a+b+c$.

18. In the figure G is the centriod of triangle ABC, with $BC = 3$ and $AC = 4$. AA_1 and BB_1 are perpendicular to each other. A circle is drawn by taking AG as diameter which intersects AB at M. Find the value of $BC.AB.BM$.



19. If $\lim_{x\to\infty}\left(\sin\frac{1}{x}+\cos\frac{1}{x}\right)^x = e^{k/2}$, then find the value of k.

20. Consider the following statements :

S_1 : If two imaginary complex numbers z_1 and z_2 are such that their sum z_1+z_2 and product z_1z_2 are real, then z_1 and z_2 are conjugate of each other.

S_2 : If the complex numbers z_1, z_2, z_3 represent the vertices of an equilateral triangle such that $|z_1|=|z_2|=|z_3|=1$, then $z_1+z_2+z_3=0$.

S_3 : If z_1, z_2, z_3 are in A.P., then z_1, z_2, z_3 lie on a circle.

State, in order, whether S_1, S_2, S_3 are true or false

(A) TTF (B) TTT (C) TFF (D) FTF

21. Consider the following statements

S_1 : The three concurrent edges of a parallelepiped represent the vectors $\vec{a}, \vec{b}, \vec{c}$ such that $[\vec{a}\,\vec{b}\,\vec{c}] = \lambda$. Then the volume of the parallelepiped whose three concurrent edges are the three concurrent diagonals of three faces of the given parallelepiped is 2λ

S_2 : If a, b, c are in A.P. then $a+\frac{1}{bc},\ b+\frac{1}{ca},\ c+\frac{1}{ab}$ are in H.P.

S_3 : If $f(x)$ is a non-negative continuous function such that $f(x)+f\left(x+\frac{1}{2}\right)=1$ for all x in $\left[0,\frac{1}{2}\right]$, then the value of $\int_0^1 f(x)\,dx$ must be $\frac{1}{2}$

(A) TFF (B) TFT (C) FFT (D) FFF

22. S_1 : If θ lies in the third quadrant, then

$$\sqrt{(4\sin^4\theta+\sin^2 2\theta)}+4\cos^2\left(\frac{\pi}{4}-\frac{\theta}{2}\right)=2$$

S_2 : If roots of a four degree equation are not real, then imaginary roots must be conjugates of each other

S_3 : If the coefficients of three consecutive terms in the expansion of $(1+x)^n$ are in the ratio $1:7:42$, then the value of n is equal to 55.

(A) T F T (B) T T T (C) T T F (D) F F F