Sample Paper-1 for part-I

Class-XII *M Marks-100*

Sub-Math *Max Time-3Hrs*

General Instructions

i. *All questions are compulsory*
ii. *This question paper consists of 29 questions divided into three sections A, B and C. Section A comprises of 10 questions of one mark each, Section B comprises of 12 questions of four marks each and Section C comprises of 7 questions of six marks each.*
iii. *All questions in section A are to be answered in one word, one sentence or as per the exact requirement of the question.*
iv. *There is no overall choice. However, internal choice has been provided in 04 questions of four marks each and 02 questions of six marks each. You have to attempt only one of the alternatives in all such questions.*

SECTION-A

1. If f(x) is invertible function, find the inverse of f(x)= (3x-2)/5
2. Solve for x: $\tan^{-1}[(1-x)/(1+x)] = \frac{1}{2}\tan^{-1}x$; x>0.
3. If $\begin{vmatrix} x+2 & 3 \\ x+5 & 4 \end{vmatrix}$= 3, find the value of x.
4. If A and B are symmetric matrices of same order then check whether AB- BA is a symmetric or skew symmetric matrix.
5. The radius of a circle is increasing at the rate 2cm/sec. At what rate is its area increasing when r= 5cm
6. Using Differentials, find the approximate value of $\sqrt{0.37}$.
7. If $x^2 + y^2 - xy = 0$, find dy/dx
8. Find: $\frac{d}{dx}\left(sin\sqrt{2x+3}\right)$.
9. Let * be a binary operation defined by a*b =3a+4b-2. Find 4*5.
10. If f(x)= x+ 7 and g(x)= x- 7, x∈R, find fog(7).

SECTION-B

11. Let T be the set of all triangles in a plane with R as a relation in T given by R={(T_1, T_2); $T_1 \cong T_2$}. Show that R is an equivalence relation.
12. Prove that: $\tan[\frac{\pi}{4} + \frac{1}{2}\cos^{-1}(a/b)] + \tan[\frac{\pi}{4} - \frac{1}{2}\cos^{-1}(a/b)] = \frac{2b}{a}$

13. Using properties of determinants, prove that following:

$\begin{vmatrix} a+b+2c & a & b \\ c & 2a+b+c & b \\ c & a & a+2b+c \end{vmatrix}$=2(a+b+c)^3

14. Using elementary transformation find the inverse of matrix $\begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$.

15. If f(x) = x^2-5x+ 7, find f(A) when A=$\begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$.

16. For the matrix A=$\begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & -3 \\ 2 & -1 & 3 \end{bmatrix}$; show that A^3-6A^2+ 5A+ 11I= 0.Hence find A^{-1}.

17. Consider f: $R^+ \rightarrow [5, \infty)$ given by f(x)= 9x^2+ 6x- 5.Show that f is invertible with f^{-1}(x)= $\left[\frac{\sqrt{y+6}-1}{3}\right]$.

OR

Let * be the binary operation on the set {1, 2, 3, 4, 5, 6,7} defined by a*b= H.C.F. of a and b. write the operation table of the operation *.

18. Show that $\sin^{-1}(2x\sqrt{1-x^2})$= 2$\sin^{-1}$x

19. Show the function f(x) =$\begin{cases} \frac{e^{\frac{1}{x}}-1}{e^{\frac{1}{x}}-1}, & when\ x \neq 0 \\ 0, & when\ x = 0 \end{cases}$ is discontinuous at x =0.

OR

Show that f(x) = $|cosx|$ is a continuous function.

20. Using Rolle's theorem, find the points on the curve y= 16-x^2, x$\in$[-1,1], where the tangent is parallel to *x*-axis

OR

If f(x)= $\left(\frac{3+x}{1+x}\right)^{2+3x}$, find f'(0).

21. Find the intervals in which f(x)= x^3-12x^2+36x+ 17 is

i. Increasing ii. Decreasing

OR

Show that the surface area of closed cuboid with sqyare base and given volume is minimum, when it is cube.

22. Find the equations of tangent and normal to the curve x= 1- cosθ, y= θ- sinθ at $\theta = \frac{\pi}{4}$.

SECTION-C

23. Solve the system of equations $\frac{2}{x} + \frac{3}{y} + \frac{10}{z} = 4$; $\frac{4}{x} - \frac{6}{y} + \frac{5}{z} = 1$; $\frac{6}{x} + \frac{9}{y} - \frac{20}{z} = 2$

24. If A=$\begin{bmatrix} 0 & -tan\frac{\alpha}{2} \\ tan\frac{\alpha}{2} & 0 \end{bmatrix}$ and I is the identity matrix of order 2, show that I+ A= (I-A) $\begin{bmatrix} cos\alpha & -sin\alpha \\ sin\alpha & cos\alpha \end{bmatrix}$.

OR

If x= 3sint-sin3t, y= 3cost-cos3t, find $\frac{d^2y}{dx^2}$ at t= $\frac{\pi}{3}$

25. If y= $\left[\log\left(x+\sqrt{1+x^2}\right)\right]^2$, show that (1+x)y”+ x y’- 2= 0

26. If x$\sqrt{1+y}$+ y$\sqrt{1+x}$= 0, find dy/dx.

27. Show that the volume of the greatest cylinder which can be inscribed in a cone of height h and semi-vertical angle α is $\frac{4}{27}\pi h^3 \tan^2\alpha$.

Or

A point on the hypotenuse of a right triangle is at a distance ‘a’ and ‘b’ from the sides of the triangle. Show that the minimum length of the hypotenuse is $\left[a^{\frac{2}{3}}+b^{\frac{2}{3}}\right]^{\frac{3}{2}}$

28. Find the maximum area of an isosceles triangle inscribed in the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ with its vertex at one end of the major axis.

29. Prove that $\tan^{-1}\left[\frac{\sqrt{1+x}-\sqrt{1-x}}{\sqrt{1+x}+\sqrt{1-x}}\right]=\frac{\pi}{4}-\cos^{-1}x, \frac{1}{\sqrt{2}}\leq x\leq 1.$

************BEST OF LUCK************