**JIYA LAL MITTAL DAV PUBLIC SCHOOL**

**GRADE – XII SA-I (SEPT, 2015)**

**SUBJECT – MATHEMATICS**

**TIME: 3hrs. M.M-100**

**Note: (1) Write clean and clear.**

 **(2) All questions are compulsory.**

 **(3) Attempt questions serial wise.**

 **Section-A (1mark each)**

1. For what value of k the matrix $\left[\begin{matrix}k&2\\3&4\end{matrix}\right] $ has no inverse.
2. Find the principal value of $sin^{-1}\left(\frac{sin5π}{6}\right)+ cos^{-1}\left(\frac{Cosπ}{6}\right) $
3. Let \* be a binary operation on set of natural number N defined by a\*b=l.c.m (a,b) where a,b ϵ N. Find (2\*3)\*6
4. Give an example of two non zero 2X2 matrices A and B such that AB=0
5. Discuss the continuity of the function given by $f\left(x\right)= x^{3}+x^{2}-1$
6. Write the number of possible matrices of order 3X3 with each entry 5 or 7.
7. Differentiate $\sin(\left(\cos(\left(x^{2}\right))\right)) with respect to x.$
8. Find the slope of the normal to the curve $x=\frac{1}{t} , y=2t at t=2$
9. Find the rate of change of the area of a circle with respect to its radius r when r=4cm.
10. Find $\frac{dy}{dx} , if x=acosθ and y=sinθ$

**Section-B (4marks each)**

1. Show that relation R in the set of all book in a library of a college, given by R={(x,y): x and y have same number of pages} is an equivalence relation

Or

 Show that relation R in the set A={1,2,3,4,5} given by R={(a,b): |a-b| is even}, is an equivalence relation.

1. Prove that $cos^{-1}\left(\frac{12}{13}\right)+sin^{-1}\left(\frac{3}{5}\right)=sin^{-1}\left(\frac{56}{65}\right) $

1. Using elementary transformation finds the inverse of $\left[\begin{matrix}1&-1\\1&3\end{matrix}\right] $

Or

 Without expanding, the determinants prove that $\left(1+\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right)$ is a factor of $\left|\begin{matrix}1+a&1&1\\1&1+b&1\\1&1&1+c\end{matrix}\right|$

1. Discuss the continuity of the function given by $f\left(x\right)=\left\{\begin{array}{c}x+2 :x\leq 1\\x-2 :x>1 \end{array} \right.$
2. Verify Larange Mean Value Theorem for f(x)=(x-3)(x-6)(x-9) in the interval [3, 5]
3. If $y=sin^{-1}x $then show that $\left(1-x^{2}\right)\frac{d^{2}y }{dx^{2}}-x\frac{dy}{dx}=0 $
4. If $y=(sinx)^{cosx}+x^{x} , find\frac{dy}{dx} $

Or

 Solve the linear equation, using matrix method $\left[\begin{matrix}5x+2y=4\\7x+3y=5\end{matrix}\right] $

1. Show that of all the rectangle inscribed in a given fixed circle, the square has the maximum area.
2. Find all the points of local maxima and local minima of the function given by $f\left(x\right)=2x^{3}-6x^{2}+6x+5 $
3. Prove that $\left|\begin{matrix}a^{2}&bc&ac+c^{2}\\a^{2}+ab&b^{2}&ac\\ab&b^{2}+bc&c^{2}\end{matrix}\right|=4a^{2}b^{2}c^{2}$

1. Solve $tan^{-1}\left(2x\right)+tan^{-1}\left(3x\right)=\frac{π}{4} $
2. If $R \rightarrow R is defind by f\left(x\right)=x^{2}-3x+2 , find f\left(f\left(x\right)\right)$

**Section-C (6marks each)**

1. Use the product $\left(\begin{matrix}1&-1&2\\0&2&-3\\3&-2&4\end{matrix}\right) \left(\begin{matrix}-2&0&1\\9&2&-3\\6&1&-2\end{matrix}\right) $to solve the system of equation $x-y+2z=1 , 2y-3z=1 , 3x-2y+4z=2 $
2. A window is in the form of a rectangle surmounted by a semi-circle. If the total perimeter of the window is 30m, find the dimension of the window so that maximum light is admitted.
3. By properties of determinants, prove that

$$\left|\begin{matrix}a^{2}+1&ab&ac\\ab&b^{2}+1&bc\\ca&cb&c^{2}+1\end{matrix}\right|=1+a^{2}+b^{2}+c^{2} $$

 **Or**

By properties of determinants, prove that

 $\left|\begin{matrix}1&1+p&1+p+q\\2&3+2p&4+3p+2q\\3&6+3p&10+6p+3q\end{matrix}\right|=1 $

1. If $x=\sqrt{a^{sin-1} (t}) , y=\sqrt{a^{cos-1}(t)} , show that \frac{dy}{dx}=\frac{-y}{x} $ **Or**

If $e^{y}\left(x+1\right) , show that\frac{d^{2}y}{dx^{2}}= \left(\frac{dy}{dx}\right)^{2 }$

1. Show that the altitude of the right circular cone of maximum volume that can be inscribed in a sphere of radius r is $\frac{4r}{3 }$
2. Find the intervals in which the function f given by $f\left(x\right)=x^{3}+\frac{1}{x^{3}} , x\ne 0 is: $ (i) Increasing (ii) Decreasing
3.
4. Find gof and fog, if $f\left(x\right)=8x^{3} and g\left(x\right)=x^{\frac{1}{3} }$
5. If f: R🡪 R be given by $\left(x\right)=(3-x)^{\frac{1}{3} } , then find fof\left(x\right).$