LIONS SCHOOL, MIRZAPUR
Half Yearly Examination 2020-21

Class : XII — Time : 3 Hrs
Sub : Mathematics — M.M. 80

General Instructions :-

All questions are compulsory.

1. The question paper consist of 36 question divided in four section A, B, C, D. Section A 20 question of one mark each. Section B 6 question of 2 mark each. Section C 6 question 4 marks each and Section D 4 question 6 marks each.

## SECTION - A

Choose and write the correct option in following question.

1. The maximum number of equivalence relation on set A {1 ,2,3} are

   a. 1 b. 2

   c. 3 d. 5c

2. The Principal value of Cos$^{-1}$ [ ½]
   5

   a. $\frac{\pi}{6}$ b. $\frac{\pi}{4}$

   c. $\frac{-\pi}{6}$ d. 1

3. A square matrix A = [$a_{ij}$] in which $a_{ij}$ = 0 i ≠ j and $a_{ij}$ = k (Constant) for i = j is a called-

   a. Unit Matrix b. Scalar Matrix

   c. Null Matrix d. Diagonal Matrix

4. Let A be a Square Matrix of Order 3x3 then |KA| is equal to-

   a. k|A| b. $k^2$|A| c. $k^3$|A| d. 3k|A|

5. If A is a singular matrix then A (adja) is -

   a. Null Matrix b. Scalar Matrix

   c. Identity Matrix d. None of these

6. The function f(x) = [x] where [x] denotes the greatest integer function is continuous at -

a. 4  b. -2  c. 1  d. none of these

7. $f(x) = x^x$ has a stationary point at -

a. x=e  b. $x = \frac{1}{e}$  c. x=1  d. $x= \sqrt{e}$

8. The point on the curve $y^2 = x$ where the tangent makes an angle of $x = \pi/4$ with x-axis is -

a. $\left[\frac{1}{2}, \frac{1}{4}\right]$  b. $\left[\frac{1}{4}, \frac{1}{2}\right]$

c. (4, 2)  d. (1, 1)

9. The maximum value of Cosx . Sinx is -

a. $\frac{1}{4}$  b. $\frac{1}{2}$  c. $\sqrt{2}$  d. $2\sqrt{2}$

10. The sides of an equilateral triangle are increasing at the rate of 2 Cm./Sec. The rate at which area increases when side is 10Cm. is -

a. 10 $Cm^2/s$  b. $\sqrt{3}$ $Cm^2/s$

c. $10\sqrt{3}$ $Cm^2s$  d. 10/3 $Cm^2/s$

The following questions consist of two statements – Assertion(A) and Reason(R). Answer these questions selecting the appropriate option given below :

(a) Both A and R are true and R is the correct explanation for A.

(b) Both A and R are true and R is not the correct explanation for A.

(c) A is true but R is false.

(d) A is false but R is true.

11. Assertion (A) : The function f(x) =[x] is discontinuous at all integers

Reason (R) : The function f(x) = [x] is not defined at integer valued.

12. Assertion (A) : $f(x) = e^x$ is an increasing function in (-∞, ∞).

Reason (R) : $f(x) = x^2 + x$ is increasing in the interval (-1/2 , ∞).

13. Assertion (A) : integrating factor of dy/dx + y cot x = cos x is sin x.

Reason (R) : integrating factor of dy/dx + Py = Q, is is $e^{\int p dx}$

14. $\int e^x$ (Cosx - Sinx) dx is equal to-

15. $\int_{2}^{2} e^x \,|\, x \cos \pi x \,|\, dx$ is equal to

16 The area enclosed by the circle $x^2+y^2 = 2$ is equal to -

17. Solution of $\frac{dy}{dx} - y = 1$, y (o) = 1 is given by

18. The second derivative of X Sinx is -

19. The domain of $f(x) = \sin^{-1}\sqrt{x-1}$ is

20. Write the principal value of $\tan^{-1}(-1)$

## SECTION - B

Ques. 21 to Ques. 26 carry 2 marks each.

21. $f(x) = |\cos x - \sin x|$ find $f^1(\pi/6)$

22. Prove that $f(x) = \tan x - x$ is always increasing.

23. Show that all positive integeral powers of symmetric matrix are symmetric.

24. if A(a,0), B (0,b) C(1,1) are collinear then using determinant prove that $1/a+1/b=1$.

25. Find the equation of the tangents to the curve $2x^2 + 3y^2 = 14$,
parallel to the line $x+3y = 4$

26. Find the dy/dx
$y = (\sin x)^{\cos x}$

## SECTION - C

Ques 27 to 32 carry 4 marks each.

27.

$$\begin{vmatrix} 0 & -\tan A/2 \\ \tan A/2 & 0 \end{vmatrix}$$

And I is the identity matrix of order 2 then show that ( I +A)= (I-A).[cosA - sinA]

28. $\int_0^{\pi/2} \log \sin 2x \, dx$

OR

$$\int_0^{\pi/2} \frac{x\,dx}{a^2\cos^2 x + 6^2\sin^2 x}$$

29. let : w $\longrightarrow$ w : f (n) = $\begin{cases} n+1 & \text{when n is even} \\ n-1 & \text{when n is odd} \end{cases}$

Show that f is invertible

30. $x = \dfrac{\sin^3 t}{\sqrt{\cos^2 t}}$ $\quad y = \dfrac{\cos^3 t}{\sqrt{\cos^2 t}}$

find $\dfrac{dy}{dx}$

31. Show that $f(x) = \begin{cases} \left[ \dfrac{e^{1/x} - 1}{e^{11x} + 1} \right] & \text{When } x \neq 0 \\ & \text{When } x = 0 \end{cases}$

is discontinuous at k = 0

32. $$\int \frac{\operatorname{Sec} x}{\operatorname{Sin}(2x+\alpha) + \operatorname{Sin}\alpha} \, dx$$

Ques. 33 to 36 carry 6 marks each.

33. Using the method of integration, find the area of region bounded by the lines $3x - 2y + 1 = 0$, $2x + 3y - 21 = 0$ and $x - 5y + 9 = 0$.

34. Show that the height of the cylinder of maximum volume, that can be inscribed in a sphere of Radius R is $\dfrac{2R}{\sqrt{3}}$ also.

35. Show that $(x - y)\, dy = (x + 2y)\, dx$ is homogeneous differential equation. Also find the general solution of the given differential equation.

36. Let A = R – {2} and B = R – {1}. If f : A $\longrightarrow$ B is define by f(x) = ( x-1/x -2 ). Show that f is one-one and onto.