ROLL NO.	
NAME	
CLASS & SECTION	

APEEJAY COMMON PRE-BOARD EXAMINATION, 2019-20

08

CLASS-XII

MATHEMATICS

Time allowed : 3 hrs. *Maximum Marks : 80*

General Instructions :

(i) All questions are compulsory

(ii) Question 1 to Question 20 carry 1 mark each.

(iii) Question 21 to Question 26 carry 2 marks each.

(iv) Question 27 to Question 32 carry 4 marks each.

(v) Question 33 to Question 36 carry 6 marks each

(SECTION–A)

(1 Mark each)

1. If A and B are square matrices of order 3 such that $|A| = -1$ and $|B| = 4$. Then what is the value of $|3(AB)|$?

   (a) –12 (b) –36

   (c) –102 (d) –108

2. If A and B are square matrices of the same order, then $(A+B)(A-B)$ is Equal to :

   (a) $A^2 - B^2$ (b) $A^2 - BA - AB - B^2$

   (c) $A^2 - B^2 + BA - AB$ (d) $A^2 - BA + B^2 + AB$

3. Let A and B be two events such that $P(A) = 0.6, P(B) = 0.2$ and $P(A/B) = 0.5$. Then P (A'/B') equals

   (a) 1/10 (b) 3/10

   (c) 3/8 (d) 6/7

4. The area of the parallelogram whose adjacent sides are $\hat{i} + \hat{k}$ and $2\hat{i} + \hat{j} + \hat{k}$ is

   (a) $\sqrt{2}$ sq, units (b) $\sqrt{3}$ sq. units

   (c) 3 sq.units (d) 4 sq.units

5. The point which does not lie in the half plane $2x+3y-12\leq 0$ is

(a) (1,2) (b) (2,1)

(c) (2,3) (d) (–3, 2)

6. Let $\theta=\sin^{-1}(\sin(-600^\circ))$ then value of θ is

(a) $\pi/3$ (b) $\pi/2$

(c) $2\pi/3$ (d) $-2\pi/3$

7. A bag contains 5 red and 3 blue balls. If 3 balls are drawn at random without replacement the probability of getting exactly one red ball is

(a) 45/196 (b) 135/392

(c) 15/56 (d) 15/29

8. $\int_{-\frac{\pi}{4}}^{\frac{\pi}{4}}\frac{dx}{1+\cos 2x}$ is equal to

(a) 1 (b) 2

(c) 3 (d) 4

9. A line makes equal angles with co-ordinate axis, Direction cosines of this line are :

(a) $\pm(1,1,1)$ (b) $\pm\left(\frac{1}{\sqrt{3}},\frac{1}{\sqrt{3}},\frac{1}{\sqrt{3}}\right)$

(c) $\pm\left(\frac{1}{3},\frac{1}{3},\frac{1}{3}\right)$ (d) $\pm\left(\frac{1}{\sqrt{3}},\frac{-1}{\sqrt{3}},\frac{-1}{\sqrt{3}}\right)$

10. If $f(x)=\begin{cases} mx+1, \text{if } x\leq\frac{\pi}{2} \\ \sin x+n, \text{if } x>\frac{\pi}{2}\end{cases}$, is continuous at $x=\frac{\pi}{2}$, then

(a) $m=1,\ n=0$ (b) $m=\frac{n\pi}{2}+1$

(c) $n=\frac{m\pi}{2}$ (d) $m=n=\frac{\pi}{2}$

11. If f be the greatest integer function defined as $f(x)=[x]$ and g be the modulus function defined as $g(x)=|x|$, then the value of $gof\left(\frac{-5}{4}\right)$ is ....

12. If $x=t^2, y=t^3$, then $\frac{d^2y}{dx^2}=$ ....

13. If A is a square matrix such that $A^2=I$, then $(A-I)^3+(A+I)^3-7A=$ ....

14. The two curves $x^3-3xy^2+2=0$ and $3x^2y-y^3=2$ cut at an angle ....

OR

The values of a for which the function $f(x)=\sin x-ax+b$ increases on R are ....

15. The angle between the vectors $\hat{i}-\hat{j}$ and $\hat{j}-\hat{k}$ is ....

OR

The projection of the vector $\vec{a}=2\hat{j}-\hat{j}+\hat{k}$ along $\vec{b}=\hat{i}+2\hat{j}+2\hat{k}$ is ....

16. Without expanding, show that

$$\Delta=\begin{vmatrix}\text{cosec}^2\theta & \cot^2\theta & 1\\ \cot^2 & \text{cosec}^2\theta & -1\\ 42 & 40 & 2\end{vmatrix}=0$$ Properties used ....

17. If $\int_0^1 \frac{e^t}{1+t}dt=a$, then find the value of $\int_0^1 \frac{e^t}{(1+t)^2}dt$ Value is ....

18. $\int \frac{\sec^2(\log x)}{x}dx$ Value is ....

OR

$\int \frac{\sin x+\cos x}{\sqrt{1+\sin 2x}}dx$ Value is ....

19. Evaluate : $\int \frac{dx}{5-8x-x^2}$ Value is ....

20. Find the differential equation representing the curve $y=cx+c^2$ Equation is ....

(SECTION–B) (2 Marks Each)

21. If $\tan^{-1}x+\tan^{-1}y=\frac{\pi}{4}, xy<1$, then find the value of $x+y+xy$

OR

If f is a invertible function, $f:R\to R$ defined as $f(x)=\frac{3x-4}{5}$, write $f^{-1}(x)$.

22. Evaluate : $\int \frac{dx}{\sqrt{x^2+2x+2}}$

23. If the radius of a sphere is measured as 9 cm with an error of 0.03 cm, then find the approximate error in calculating its surface area.

24. If $|\vec{a}|=a$, then find the value of the following

$$|\vec{a}\times\hat{i}|^2+|\vec{a}\times\hat{j}|^2+|\vec{a}\times\hat{k}|^2$$

OR

For any two vectors $\vec{a}$ and $\vec{b}$, Prove that $(\vec{a}\times\vec{b})^2=\vec{a}^2\,\vec{b}^2-(\vec{a}.\vec{b})^2$

25. Find the value of p so that the lines $\frac{1-x}{3}=\frac{7y-14}{2p}=\frac{5z-10}{11}$ and $\frac{7-7x}{3p}=\frac{y-5}{1}=\frac{6-z}{5}$ are perpendicular to each other.

26. A die, whose faces are marked 1, 2, 3 in red and 4, 5, 6 in green, is tossed. Let A be the event 'number obtained is green' and B be the event 'number obtained is red'. Find A and B are independent events or not.

(SECTION–C) (4 marks each)

27. Let $A=\{x\in Z:0\le x\le 12\}$. Show that $R=\{(a,b):a,b\in A,|a-b|$ is divisible by 4$\}$ is an Equivalence relation, Write the equivalence class [2].

28. Find the equation(s) of the tangent(s) to the curve $y=(x^3-1)(x-2)$ at the points where the curve intersects the x-axis.

OR

If $x^m y^n=(x+y)^{m+n}$, prove that $\frac{d^2y}{dx^2}=0$

29. Prove that $x^2-y^2=c(x^2+y^2)^2$ is the general solution of the differential equation $(x^3-3xy^2)dx=(y^3-3x^2y)dy$, where c is a parameter.

30. Evaluate : $\int_0^{3/2}|x\sin\pi x|\,dx$.

31. There are 4 cards numbered 1, 3, 5 and 7, one number on one card. Two cards are drawn at random without replacement. Let X denote the sum of the numbers on the two drawn cards. Find the mean and variance of X.

OR

Of the students in a school, it is known that 30% have 100% attendance and 70% Students are irregular. Previous year results report that 70% of all students who have 100% attendance attain A grade and 10% irregular students attain A grade in their annual examination. At the end of the year one student is chosen at random from the school and he was found to have an A grade. What is the probability that the student has 100% attendance?

32. Maximize $z = x + 2y$

Subject to the constraints

$x + 2y \geq 100$

$2x - y \leq 0$

$2x + y \leq 200$

$x, y \geq 0$

Solve the above LPP graphically.

(SECTION–D) (6 marks each)

33. Using properties of determinants, prove that

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

OR

If $A = \begin{bmatrix} 3 & 2 & 1 \\ 4 & -1 & 2 \\ 7 & 3 & -3 \end{bmatrix}$, find A^{-1} and hence solve the following system of equations

$3x + 4y + 7z = 14,\ 2x - y + 3z = 4,\ x + 2y - 3z = 0$

34. Using integration find the area of the region in the first quadrant enclosed by the x-axis, the Line $y = x$ and the circle $x^2 + y^2 = 32$.

OR

Using integration, find the area of the triangle formed by positive x-axis and tangent and normal to the circle $x^2 + y^2 = 4$ at $(1, \sqrt{3})$.

35. If the sum of lengths of the hypotenuse and a side of a right angled triangle is given, Show that the area of the triangle is maximum, when the angle between them is $\frac{\pi}{3}$.

36. Find the equation of the plane through the line of intersection of $\vec{r}.(2\hat{i}-3\hat{j}+4\hat{k})=1$ and $\vec{r}.(\hat{i}-\hat{j})+4=0$ and perpendicular to the plane $\vec{r}.(2\hat{i}-\hat{j}+\hat{k})+8=0$. Hence find whether the plane thus obtained contains the line $x-1=2y-4=3z-12$.

BEST OF LUCK!