# A M R ITA VIDY A LAYAM <br> ANNUAL EXAMINATION 2019-20 

## MATHEMATICS

## GENERAL INSTRUCTIONS:

1. All questions are compulsory.
2. This question paper consists of 36 questions divided into four sections $A, B, C$ and $D$. Section A comprises 20 questions of 1 mark each.
Section B comprises 6 questions of 2 marks each.
Section C comprises 6 questions of 4 marks each.
Section D comprises 4 questions of 6 marks each.
3. There is no overall choice. However, an internal choice has been provided in 2 questions of one mark each, 3 questions of two marks each, 2 questions of four marks each and 2 questions of six marks each. You have to attempt only one of the alternatives in all such questions.
4. Use of calculators is not permitted.

## SECTION - A

1. The centroid of a triangle ABC is $(1,2,3)$. If the co-ordinates of $A$ and $B$ are $(3,-5,7)$ and $(-1,7,-6)$ then the co-ordinates of C is $\qquad$ .
a) $(1,1,2)$
b) $(2,1,1)$
c) $(1,4,8)$
d) $(1,0,2)$
2. Does the point $(-2.5,3.5)$ lie inside, outside or on the circle $x^{2}+y^{2}=25$.
a) outside
b) inside
c) on the circle
d) none of these
3. The equation of the intercept form $x / 6+y / 4=1$ is $\qquad$ .
a) $3 x+2 y+12=0$
b) $3 x-2 y-12=0$
c) $3 x+2 y-12=0$
d) none of these
4. Find the value of $x$ for which the points $(x,-1),(2,1)$ and $(4,5)$ are collinear.
a) $x=-2$
b) $x=1$
c) $x=0$
d) $x=-1$
5. $7 \pi / 6$ radian $=$ $\qquad$ degree.
a) $210^{\circ}$
b) $300^{\circ}$
c) $240^{\circ}$
d) $120^{\circ}$
6. Let $A=\{x, y, z\}$ and $B=\{1,2\}$, find the number of relations from $A$ to $B$.
a) $2^{5}$
b) $2^{6}$
c) $2^{7}$
d) $2^{8}$
7. Find the range of the function $f(x)=x^{2}+2, x \in R$.
a) $(2,0)$
b) $(2, \infty)$
c) $(2, \infty)$
d) $(0,0)$
8. If a $>\mathrm{b}$ and $\mathrm{c}<\mathrm{d}$ then $\qquad$ .
a) $a+c<b+d$
b) $a+c>b+d$
c) $a-d<b-c$
d) $a-c>b-d$
9. Coefficient of $x^{5}$ in the expansion of $\left(1+x^{2}\right)^{5}(1+x)^{4}$ is $\qquad$ .
a) 40
b) 50
c) 30
d) 60
10. If $A$ and $B$ are mutually exclusive and exhaustive events then $P(A)+P(B)=$ $\qquad$ .
a) 0
b) 1
c) $1 / 2$
d) 2
11. The general solution for $\mathrm{x}, \mathrm{y} \varepsilon \mathrm{R}, \sin \mathrm{x}=\sin \mathrm{y}$ is $\qquad$ .
12. The equation of hyperbola with vertices $( \pm 2,0)$ and foci $( \pm 3,0)$ is $\qquad$ .
13. The solution of $4 x-2>6$ is $\qquad$ .
14. The derivative of $x^{2}-2$ at $x=10$ is $\qquad$ .

The derivative of $2 x^{2}+6 x+2$ is $\qquad$ .
15. If $\frac{1}{6!}+\frac{1}{7!}=\frac{x}{8!}$, then $x$ is $\qquad$ .
16. If $f(x)=x^{2}$ and $g(x)=2 x+1$ be two real valued functions, then find $(f+g)(x)$.
17. Consider the points $\mathrm{A}(2,1,3)$ and $\mathrm{B}(1,2,1)$. Find the ratio in which the join of AB is divided by YZ plane.
18. Find the equation of the line passing through the point $(-4,3)$ with slope $1 / 2$.

OR
Find a point on the x -axis which is equidistant from the points $(7,6)$ and $(3,4)$.
19. If Arithmetic Mean and Geometric Mean of two numbers are 10 and 8 respectively, find the numbers.
20. A coin is tossed, if the outcome is a head, a die is thrown. If the die shows up an even number, the die is thrown again. What is the sample space for the experiment?

## SECTION - B

21. Let $\mathrm{f}=\{(1,1),(2,3),(0,-1),(-1,-3)\}$ be a function from Z to Z defined by $\mathrm{f}(\mathrm{x})=\mathrm{ax}+\mathrm{b}$, for some integers $\mathrm{a}, \mathrm{b}$. Determine $\mathrm{a}, \mathrm{b}$.

OR
Find the domain and range of the real function f defined by $\mathrm{f}(\mathrm{x})=\sqrt{\mathrm{x}-1}$.
22. A wheel makes 360 revolutions in one minute. Through how many radians does it turn in one second.
23. Find the equation of set of points $P$ such that $\mathrm{PA}^{2}+\mathrm{PB}^{2}=2 \mathrm{k}^{2}$ where A and B are the points $(3,4,5)$ and $(-1,3,-7)$ respectively.

OR
Find the co-ordinates of the point, which divides the line segment joining the points $(5,4,2)$ and $(-1,-2,4)$ in the ratio $2: 3$.
24. One card is drawn from a well shuffled deck of 52 cards. If each outcome is equally likely, calculate the probability that the card will be
a) a diamond.
b) not an ace.
25. Find the equation of an ellipse that satisfies length of major axis 18 and foci $( \pm 3,0)$.

OR
Find the co-ordinates of the foci, the vertices, the length of major and minor axis and the eccentricity of the ellipse $\frac{x^{2}}{4}+\frac{y^{2}}{9}=1$.
26. Two students A and B appeared in an examination. The probability that A passes the exam is 0.25 and that B passes is 0.45 . Also the probability that both will pass is 0.1 Find the probability that
a) both will not pass.
b) only one of them will pass.

## SECTION - C

27. Find the length of perpendicular from the origin to the line joining the points whose co-ordinates are $(\cos \theta, \sin \theta)$ and $(\cos \theta, \sin \theta)$.

## OR

Point $\mathrm{R}(\mathrm{h}, \mathrm{k})$ divides a line segment between the axes in the ratio $1: 2$. Find the equation of the line.
28. Find the general solution of $\sin x+\sin 3 x+\sin 5 x=0$.
29. If $f(x)=\frac{x-1}{x+1}$ then show that
a) $f(1 / x)=-f(x)$
b) $f(-1 / x)=-1 / f(x)$
30. Find r and n in the following.
a) $5 \mathrm{P}_{\mathrm{r}}=2.6 \mathrm{P}_{\mathrm{r}-1}$
b) $2 \mathrm{n} \mathrm{C}_{3}: \mathrm{nC}_{3}=12: 1$
31. A committee of two persons is selected from two men and two women. What is the probability that the committee will have
a) no man?
b) one man?
c) two men?

OR
If 4 - digit number greater than 5000 are randomly formed from the digits $0,1,3,5$ and 7 . What is the probability of forming a number divisible by 5 when
a) the digits are repeated?
b) the repeatition of digits is not allowed?
32. Find the coefficient of $x^{9}$ in the expansion of $\left(x^{2}-1 / 3 x\right)^{9}$. Also find the term which is independent of $x$.

## SECTION - D

33. Find $\sin x / 2, \cos x / 2, \tan x / 2$ if $\sin x=1 / 4, x$ in $2^{\text {nd }}$ quadrant.

OR
Prove the following.
a) $(\cos x+\cos y)^{2}+(\sin x-\sin y)^{2}=4 \cos ^{2}(x+y) / 2$
b) $2 \cos \pi / 13 \cos 9 \pi / 13+\cos 3 \pi / 13+\cos 5 \pi / 13=0$
34. Solve the following system of inequalities graphically. $x+2 y \leq 10, x+y \geq 1, x-y \leq 0, x \geq 0, y \geq 0$
35. If $a$ and $b$ are the roots of $x^{2}-3 x+p=0$ and $c, d$ are roots of $x^{2}-12 x+q=0$ where $a, b, c, d$ form a G.P. Prove that $(\mathrm{q}+\mathrm{p}):(\mathrm{q}-\mathrm{p})=17: 15$.

OR
The $p^{\text {th }}, q^{\text {th }}$ and $r^{\text {th }}$ terms of an A.P are $a, b, c$ respectively. Show that $(\mathrm{q}-\mathrm{r}) \mathrm{a}+(\mathrm{r}-\mathrm{p}) \mathrm{b}+(\mathrm{p}-\mathrm{q}) \mathrm{c}=0$.
36.
a) Evaluate $\lim _{x \rightarrow 3} \frac{x^{4}-81}{2 x^{2}-5 x-3}$
b) Find the derivative of $\cos x$ using first principle.

