

HS/XI/A. Sc. Com/M/20

2020

**MATHEMATICS***Full Marks : 80**Time : 3 hours**General Instructions :*

1. All questions are compulsory.
2. The question paper consists of 36 questions divided into four Sections A, B, C and D.  
Section A consists of 20 questions of 1 mark each.  
Section B consists of 6 questions of 2 marks each.  
Section C consists of 6 questions of 4 marks each.  
Section D consists of 4 questions of 6 marks each.
3. There is no overall choice. However there will be internal choices for 4 marks questions and 6 marks questions.
4. Use of calculator is not permitted.

## SECTION – A

1. If U=set of natural numbers and  $A = \{x : 2x + 5 = 9\}$ . Find  $A'$ .

2. Write the power set of  $A = \{1, 2\}$ .
3. Find the slope of the line passing through the points  $(3, -2)$  and  $(-1, 4)$ .
4. Find the general solutions of  $\sin x = \frac{\sqrt{3}}{2}$ .
5. One card is drawn from a well-shuffled deck of 52 cards. If its outcome are equally likely, calculate the probability of a diamond card.
6. If  ${}^nC_9 = {}^nC_8$ , Find  ${}^nC_{15}$ .
7. Let  $A = \{1, 2, 3, \dots, 14\}$ . Define a relation R from A to A by  $R = \{(x, y) : 3x - y = 0, \text{ where } x, y \in A\}$ .  
Write down its domain.
8. If  $\left(\frac{x}{3} + 1, y - \frac{2}{3}\right) = \left(\frac{5}{3}, \frac{1}{3}\right)$  find the value of x and y.
9. Find the middle term in the expansion of  $\left(x + \frac{1}{x}\right)^6$ .
10. Find the component of the compound statement.  
“All integer are positive or negative”.

( 3 )

11. Solve the equation  $2x^2 + x + 1 = 0$ .
12. Solve for  $x$ , if  $3x + 8 > 2$  when  $x$  is an even integer.
13. List all the elements of the following set  
$$A = \left\{ x : x \text{ is an integer and } -\frac{1}{2} < x < \frac{9}{2} \right\}$$
14. Convert  $108^\circ$  into radian measure.
15. Find the intercepts cut off by the straight line  $3x + 2y = 6$  from the co-ordinate axes.
16. Given statement  
 $p$  : Two lines intersect at a point or they are parallel.  
Check whether the given statement is true or false.
17. Evaluate  $\lim_{x \rightarrow 0} \frac{(x+1)^3 - 1}{x}$
18. Find the number of words that could be formed with the letters of the word "COLLEGE".
19. If  $\frac{2}{7}, x, \frac{7}{2}$  are in Geometric progression, find the value of  $x$ .

( 4 )

20. Find the median of the following raw data :  
2, 4, 5, 7, 10, 8, 12, 17, 19.

### SECTION – B

21. Find the value of  $\tan 15^\circ$
22. If  $\frac{1}{8!} + \frac{1}{9!} = \frac{x}{10!}$ , find  $x$ .
23. Find the equation of the line parallel to the line  $3x - 4y + 2 = 0$  and passing through the point  $(-2, 3)$ .
24. Expand the expression  $\left(\frac{2}{x} - \frac{x}{2}\right)^5$ .
25. Find the co-ordinates of the point which divides the line segment joining the points  $(5, 4, 2)$  and  $(-1, -2, 4)$  internally in the ratio 3 : 4.
26. Given  $P(A) = \frac{3}{5}$  and  $P(B) = \frac{1}{5}$ . Find  $P(A \cup B)$  if A and B are mutually exclusive events.

### SECTION – C

27. Let  $A = \{ 1, 2, 3, 4, 6 \}$ . Let R be the relation on A defined by  $R = \{ (a, b) : a, b \in A, b \text{ is exactly divisible by } a \}$ .  
Write R in roster form and find the domain and range of R.

( 5 )

- 28.** If  $(x + iy)^3 = u + iv$ , then show that  $\frac{u}{x} + \frac{v}{y} = 4(x^2 - y^2)$ .

*Or*

Convert the complex number  $z = -1 + i$  in the polar form.

- 29.** Find the general solutions of the equation  
 $\cos 3x + \cos x - \cos 2x = 0$

*Or*

Show that

$$\tan 3x \tan 2x \tan x = \tan 3x - \tan 2x - \tan x.$$

- 30.** A group consists of 4 girls and 7 boys. In how many ways can a team of 5 members be selected if the team has atleast one boy and one girl.

*Or*

By the principle of mathematical induction prove that

$$1 + 3 + 3^2 + \dots + 3^{n-1} = \frac{(3^n - 1)}{2}.$$

- 31.** Find the equation of the circle with radius 5 whose centre lies on the  $x$ -axis and passes through the point (2, 3).

( 6 )

*Or*

Find the co-ordinates of the foci, the vertices, the length of the major axis, the eccentricity and the length of latus rectum of the ellipse  $16x^2 + y^2 = 16$ .

- 32.** Find the derivative of  $\tan x$  from 1st principle.

### SECTION – D

- 33.** In a survey of 60 people, it was found that 25 people read newspaper H, 26 read newspaper T, 26 read newspaper I, 9 read both H and I, 11 read both H and T, 8 read both T and I, 3 read all three newspapers. Find

- (i) the number of people who read at least one of the newspaper.
- (ii) the number of people who read exactly one newspaper.

- 34.** The sum of  $n$  terms of two arithmetic progressions are in the ratio  $5n + 4 : 9n + 6$ . Find the ratio of their 18<sup>th</sup> terms.

*Or*

Sum of the first  $p$ ,  $q$  and  $r$  terms of an A.P are  $a$ ,  $b$ , and  $c$  respectively.

Prove that  $\frac{a}{p}(q - r) + \frac{b}{q}(r - p) + \frac{c}{r}(p - q) = 0$ .

( 7 )

**35.** Find 'a' if the 17<sup>th</sup> and 18<sup>th</sup> terms of the expansion  $(x+a)^{50}$  are equal.

**36.** The mean of 5 observation is 4.4 and their variance is 8.24. If three of the observations are 1, 2 and 6, find the other two observation.

*Or*

Calculate mean, variance and standard deviation for the following distribution.

Classes	30-40	40-50	50-60	70-80	80-90	90-100
Frequency	3	7	12	8	3	2

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