

CITY SCHOOL OF EDUCATIONAL INSTITUTE, PANDHURNA

OPEN BOOK EXAMINATION 2020-21

Class-11<sup>th</sup>

Subject- Mathematics

Time – 3 hour

Max. Mark– 100

General Instructions:-

1. All questions are compulsory.
- 2 Section A is Q.1 to Q.5 are objective type questions. Solve as directed.

Internal choices are given.

3. Section B is from Q.6 to Q.11, each carries 3 marks.
4. Section C is from Q.12 to Q.16, each carries 4marks.
5. Section D is from Q.17 to Q.21, each carries 5 marks.
5. Section E is from Q.22 to Q.23, each carries 6 marks.

Section-A

Q.1- Choose the correct option and write-

1. If A, B and C are any three sets, then  $A - (B \cup C)$  is equal to

- (a)  $(A - B) \cup (A - C)$  (b)  $(A - B) \cup C$   
(c)  $(A - B) \cap C$  (d)  $(A - B) \cap (A - C)$

2. The period of the function  $f(x) = \sin^4 3x + \cos^4 3x$  is

- (a)  $\pi/2$  (b)  $\pi/3$   
(c)  $\pi/4$  (d)  $\pi/6$

3. The sum of the series  $1^3 + 2^3 + 3^3 + \dots + n^3$  is

- (a)  $\{(n + 1)/2\}^2$  (b)  $\{n/2\}^2$   
(c)  $n(n + 1)/2$  (d)  $\{n(n + 1)/2\}^2$

4. The least value of n for which  $\{(1 + i)/(1 - i)\}^n$  is real, is

- (a) 1 (b) 2  
(c) 3 (d) 4

5. If  $x^2 = 4$  then the value of x is

- (a) -2 (b) 2  
(c) -2, 2 (d) None of these

Q.2-Fill in the blanks-

1. The value of  $\cos 180^\circ$  is \_\_\_\_\_.
2. Sum of two rational numbers is \_\_\_\_\_ number.
3. The number of ways in which 8 distinct toys can be distributed among 5 children is \_\_\_\_\_.
4.  $(1.1)^{10000}$  is \_\_\_\_\_ 1000.
5. If  $3 \times \tan(x - 15) = \tan(x + 15)$ , then the value of x is \_\_\_\_\_.

Q.3-Match the column –

Column A

- i.  $A \cup B = B \cup A$   
ii.  $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$   
iii.  $A \cup \phi = A$   
iv.  $A \cup A = A$   
v.  $U \cup A = U$

Column B

- Law of U  
Idempotent law  
Commutative law  
Associative law  
Law of identity element,  $\phi$  is the identity of U

#### Q.4-Write True/False-

1.  $\{ (A, B) : A^2 + B^2 = 1 \}$  on the sets has the following relation is Symmetric.
2.  $A \subset B$  if  $a \in A \Rightarrow a \in B$  is Subset.
3. The value of  $\cos 5\pi$  is 1.
4. Empty set is a Infinite set.
5.  $i^{-999}$  is value  $i$ .

#### Q.5-Answer in one word/Sentence-

1. If  $x^2 = -4$  then the value of  $x$  is
2. The value of  $P(n, n - 1)$  is
3. The general term of the expansion  $(a + b)^n$  is
4. If  $\cos a + 2\cos b + \cos c = 2$  then  $a, b, c$  are in
5. The value of  $4 \times \sin x \times \sin(x + \pi/3) \times \sin(x + 2\pi/3)$  is

### Section-B

Q.6-In the following, state whether  $A = B$  or not:

- (i)  $A = \{a, b, c, d\}; B = \{d, c, b, a\}$
- (ii)  $A = \{4, 8, 12, 16\}; B = \{8, 4, 16, 18\}$
- (iii)  $A = \{2, 4, 6, 8, 10\}; B = \{x: x \text{ is positive even integer and } x \leq 10\}$
- (iv)  $A = \{x: x \text{ is a multiple of } 10\}; B = \{10, 15, 20, 25, 30 \dots\}$

Q.7-Let  $A = \{1, 2, 3, 4, 6\}$ . Let  $R$  be the relation on  $A$  defined by  $\{(a, b): a, b \in A, b \text{ is exactly divisible by } a\}$ .

- (i) Write  $R$  in roster form
- (ii) Find the domain of  $R$
- (iii) Find the range of  $R$

Q.8-Find the radian measures corresponding to the following degree measures:

- (i)  $25^\circ$
- (ii)  $-47^\circ 30'$
- (iii)  $240^\circ$

Q.9-Prove the following by using the principle of mathematical induction for

$$1^3 + 2^3 + 3^3 + \dots + n^3 = \frac{n(n+1)}{2}^2 \quad \text{all } n \in \mathbb{N}$$

Q.10-Find the real numbers  $x$  and  $y$  if  $(x - iy)(3 + 5i)$  is the conjugate of  $-6 - 24i$ .

Q.11-Solve the given inequality graphically in two-dimensional plane:  $x + y < 5$ .

### Section-C

Q.12-

$$\text{Find } r \text{ if (i) } {}^5P_r = 2^6 P_{r-1} \text{ (ii) } {}^5P_r = 6 P_{r-1}.$$

Q.13-Using Binomial Theorem, evaluate  $(102)^5$  and  $(99)^5$ .

Q.14-Given the sets  $A = \{1, 3, 5\}$ ,  $B = \{2, 4, 6\}$  and  $C = \{0, 2, 4, 6, 8\}$ , which of the following may be considered as

universal set (s) for all the three sets  $A, B$  and  $C$

- (i)  $\{0, 1, 2, 3, 4, 5, 6\}$
- (ii)  $\Phi$

(iii) {0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10}

(iv) {1, 2, 3, 4, 5, 6, 7, 8}

Q.15-Find the range of each of the following functions.

(i)  $f(x) = 2 - 3x$ ,  $x \in \mathbb{R}$ ,  $x > 0$ .

(ii)  $f(x) = x^2 + 2$ ,  $x$  is a real number.

(iii)  $f(x) = x$ ,  $x$  is a real number

Q.16- Find the value of:

(i)  $\sin 75^\circ$

(ii)  $\tan 15$

### Section-D

Q.17-

$$\text{If } \left(\frac{1+i}{1-i}\right)^m = 1, \text{ then find the least positive integral value of } m.$$

Q.18- Solve the following system of inequalities graphically:  $2x - y > 1$ ,  $x - 2y < -1$ .

Q.19-A committee of 7 has to be formed from 9 boys and 4 girls. In how many ways can this be done when the committee consists of:

(i) exactly 3 girls? (ii) atleast 3 girls? (iii) atmost 3 girls?

Q.20-The coefficients of the  $(r-1)^{\text{th}}$ ,  $r^{\text{th}}$  and  $(r+1)^{\text{th}}$  terms in the expansion of  $(x+1)^n$  are in the ratio 1:3:5. Find  $n$  and  $r$ .

Q.21-

The relation  $f$  is defined by

$$f(x) = \begin{cases} x^2, & 0 \leq x \leq 3 \\ 3x, & 3 \leq x \leq 10 \end{cases}$$

The relation  $g$  is defined by

$$g(x) = \begin{cases} x^2, & 0 \leq x \leq 2 \\ 3x, & 2 \leq x \leq 10 \end{cases}$$

Show that  $f$  is a function and  $g$  is not a function.

### Section-E

Que.22- Make correct statements by filling in the symbols or  $\hat{=}$  in the blank spaces:

(i)  $\{2, 3, 4\} \dots \{1, 2, 3, 4, 5\}$

(ii)  $\{a, b, c\} \dots \{b, c, d\}$

(iii)  $\{x: x \text{ is a student of Class XI of your school}\} \dots \{x: x \text{ student of your school}\}$

(iv)  $\{x: x \text{ is a circle in the plane}\} \dots \{x: x \text{ is a circle in the same plane with radius 1 unit}\}$

(v)  $\{x: x \text{ is a triangle in a plane}\} \dots \{x: x \text{ is a rectangle in the plane}\}$

(vi)  $\{x: x \text{ is an equilateral triangle in a plane}\} \dots \{x: x \text{ is a triangle in the same plane}\}$  (vii)  $\{x: x \text{ is an even natural number}\} \dots \{x: x \text{ is an integer}\}$

Q.23-

Find  $\sin \frac{x}{2}$ ,  $\cos \frac{x}{2}$  and  $\tan \frac{x}{2}$  for  $\sin x = \frac{1}{4}$ ,  $x$  in quadrant II