

**KOTHARI INTERNATIONAL SCHOOL, NOIDA**  
**ANNUAL EXAMINATION, SESSION: 2023-24**  
**GRADE: 11 SUBJECT: MATHEMATICS (041)**  
**SET A**

**DATE& DAY: MONDAY FEBRUARY 05, 2024**

**MAXIMUM MARKS: 80**

**NAME: \_\_\_\_\_**

**TIME ALLOTTED: 3 HOUR**

**ROLL NO: \_\_\_\_\_**

**GENERAL INSTRUCTIONS:**

- i). This is objective & Subjective Question Paper containing 38 questions.
- ii). This paper contains 20 questions of 1 marks each, 5 questions of 2 marks each and 6 questions of 3 marks each 4 questions of 5 marks each and 3 case/source based questions of 4 marks each.
- iii). 1 marks questions are MCQs
- iv). 2 and 3 marks questions are Short Answer Type Questions and are to be answered in 50-80 words.
- v). 5 marks questions are Long Answer Type Questions and are to be answered in 80-120 words.
- vi). This question paper contains Case/Source Based Questions.

**SECTION – A**

- Q1.** The range of the function  $f(x) = 3x - 2$ , is (1)
- (a)  $(-\infty, \infty)$
  - (b)  $\mathbf{R - \{3\}}$
  - (c)  $(-\infty, \mathbf{0})$
  - (d)  $(\mathbf{0}, \infty)$
- Q2.** The set  $A = \{14, 21, 28, 35, 42, \dots, 98\}$  in set-builder form is: (1)
- (a)  $A = \{x : x = 7n, n \in \mathbf{N} \text{ and } 1 \leq n \leq 15\}$
  - (b)  $A = \{x : x = 7n, n \in \mathbf{N} \text{ and } 2 \leq n \leq 14\}$
  - (c)  $A = \{x : x = 7n, n \in \mathbf{N} \text{ and } 3 \leq n \leq 13\}$
  - (d)  $A = \{x : x = 7n, n \in \mathbf{N} \text{ and } 4 \leq n \leq 12\}$
- Q3.** Total number of elements in the power set of A containing 15 elements is : (1)
- (a)  $2^{15}$
  - (b)  $15^2$
  - (c)  $2^{15-1}$
  - (d)  $2^{15} - 1$
- Q4.** The domain and range of the function f given by  $f(x) = 2 - |x - 5|$  is (1)
- (a) Domain =  $\mathbf{R^+}$ , Range =  $(-\infty, 1]$
  - (b) Domain =  $\mathbf{R}$ , Range =  $(-\infty, 2]$
  - (c) Domain =  $\mathbf{R}$ , Range =  $(-\infty, 2)$
  - (d) Domain =  $\mathbf{R^+}$ , Range =  $(-\infty, 2]$

- Q5.** The large hand of a clock is 42 cm long. How much distance does its extremity move in 20 minutes? (1)
- (a) 88cm  
(b) 80cm  
(c) 75cm  
(d) 77cm
- Q6.** If  $\tan A = 3$  and  $A$  lies in III quadrant, then find the value of  $\sin A$  is (1)
- (a)  $\frac{1}{\sqrt{10}}$   
(b)  $\frac{2}{\sqrt{10}}$   
(c)  $-\frac{3}{\sqrt{10}}$   
(d)  $-\frac{5}{\sqrt{10}}$
- Q7.** If  $i^{103} = a + ib$ , then  $a + b$  is equal to (1)
- (a) 1  
(b) - 1  
(c) 0  
(d) 2
- Q8.** If  $\frac{(1+i)^2}{2-i} = x + iy$  then the value of  $x + y$  (1)
- (a) 1/5  
(b) 2/5  
(c) 3/5  
(d) 4/5
- Q9.** If  $\frac{x-2}{x+5} > 2$ , then  $x \in$  (1)
- (a) (- 12, 5)  
(b) (-12, - 5)  
(c) (- 5, 12)  
(d) (5, 12)
- Q10.** The number of ways in which the digits of the number 125453752 can be rearranged such that no two 5's come together, is (1)
- (a)  $\frac{9!}{3!2!}$   
(b)  $\frac{7!}{3!2!}$   
(c)  $\frac{C(7,3)6!}{2!}$   
(d)  $\frac{C(7,4)8!}{2!}$

- Q11.** There are four balls of different colors and four boxes of colors same as those of the balls. The number of ways in which the balls, one in each box, could be placed such that a ball does not go to box of its own color, is (1)
- (a) 8  
(b) 7  
(c) 9  
(d) 10
- Q12.**  $3^{1/2} \times 3^{1/4} \times 3^{1/8} \times \dots$  upto infinite terms is equal to (1)
- (a) 9  
(b) 3  
(c) 27  
(d) 81
- Q13.** If  $n$  terms of GP  $3, 3^2, 3^3, \dots$  are needed to give the sum 120, then the value of  $n$  is (1)
- (a) 2  
(b) 3  
(c) 4  
(d) 5
- Q14.** Find the equation of the parabola which is symmetric about the  $y$ -axis, and passes through the point  $(2, -3)$ . (1)
- (a)  $x^2 = 4y$   
(b)  $4y = 3x^2$   
(c)  $3x^2 = -4y$   
(d)  $3y = -4x^2$
- Q15.** The eccentricity of the hyperbola  $x^2 - y^2 = 2004$  is (1)
- (a)  $\sqrt{3}$   
(b) 2  
(c)  $2\sqrt{2}$   
(d)  $\sqrt{2}$
- Q16.** The derivative of  $\frac{x^5 - \cos x}{\cos x}$  is (1)
- (a)  $\frac{x^5 \cos x}{\sin^2 x}$   
(b)  $\frac{1}{\sin x} - \frac{x^5 \cos x}{\sin^2 x}$   
(c)  $\frac{x}{\sin^2 x}$   
(d) None of these
- Q17.** The probability that a patient visiting a dentist will have a tooth extracted is 0.06, the probability that he will have a cavity filled is 0.2, and the probability that he will have a tooth extracted or a cavity filled is 0.23. What is the probability that he will have a tooth extracted as well as a cavity filled? (1)

- (a) 0.03
- (b) 0.04
- (c) 0.05
- (d) 0.06

- Q18.** Two students Anil and Ashima appeared in an examination. The probability that Anil will qualify the examination is 0.05 and that Ashima will qualify the examination is 0.10. The probability that both will qualify the examination is 0.02. Find the probability that only one of them will qualify the examination (1)
- (a) 0.11
  - (b) 0.10
  - (c) 0.12
  - (d) 0.13

#### Assertion – Reason based questions

In questions 7 and 8, a statement of assertion (A) is followed by a statement of Reason (R) is given. Choose the correct answer out of the following choices.

- (a) Both A and R are true and R is the correct explanation of A.
  - (b) Both A and R are true and R is not the correct explanation of A.
  - (c) A is true but R is false.
  - (d) A is false but R is true.
- Q19.** **Assertion (A)** Let  $A = \{1, 2\}$  and  $B = \{3, 4\}$ . Then, number of relations from  $A$  to  $B$  is 16. (1)
- Reason (R)** If  $n(A) = p$  and  $n(B) = q$ , then number of relations is  $2^{pq}$ .
- Q20.** **Assertion (A)** If  $n$ th term of a sequence is  $a_n = \frac{n^2}{2^n}$ , then its 7th term is  $\frac{49}{128}$ . (1)
- Reason (R)** If  $n$ th term of a sequence is  $a_n = \frac{n(n-2)}{n+3}$ , then its 20th term is  $\frac{323}{22}$ .

#### SECTION B

- Q21.** Find the domain and range of :  $\sqrt{9-x^2}$  (2)
- Q22.** Evaluate: (2)
- $$\frac{\cos(\pi+x) \cos(-x)}{\sin(\pi-x) \cos\left(\frac{\pi}{2}+x\right)}$$

- Q23.** Solve the given inequality for real  $x$  : (2)

$$\frac{(2x-1)}{3} \geq \frac{(3x-2)}{4} - \frac{(2-x)}{5}$$

- Q24.** Find the equation of the set of points which are equidistant from the points (1, 2, 3) and (3, 2, - 1). (2)

- Q25.** Three letters are dictated to three persons and an envelope is addressed to each of them, the letters are inserted into the envelopes at random so that each envelope contain exactly one letter. Find the probability that at least one letter is in its proper envelop. (2)

### **SECTION C**

- Q26.** Prove that  $\sin 2x + 2 \sin 4x + \sin 6x = 4\cos^2 x \sin 4x$  (3)

- Q27.** Find the number of non – zero integral solution of the equation  $|1 - i|^x = 2^x$  (3)

- Q28.** Find  $(x + 1)^6 + (x - 1)^6$ . Hence, evaluate  $(\sqrt{2} + 1)^6 + (\sqrt{2} - 1)^6$  (3)

- Q29.** Find the equation of the line(s) passing through the point (2, 2) and cutting off intercepts on the axes whose sum is 9. (3)

- Q30.** Differentiate the following functions with respect to  $x$ : (3)

(i)  $y = \frac{\sin(ax+b)}{\cos(cx+d)}$

(j)  $y = 2\sqrt{\cot x^2}$

- Q31.** A 4 – digit number greater than 5,000 are to be formed from the digits 0, 1, 3, 5 and 7. What is the probability of forming a number divisible by 5 when the digits are repeated. (3)

### **SECTION D**

- Q32.** Find the mean deviation about the mean for the data given below: (5)

Income per day	Number of persons
0 – 100	4
100 – 200	8
200 – 300	9
300 – 400	10
400 – 500	7
500 – 600	5
600 – 700	4
700 – 800	3

- Q33.** Find the equation of the Circle which passes through the points (4, 1), (6, 5) and whose centre lies on (5)  $x = 5$

the line  $4x + y = 16$ .

**Q34.** The sum of three numbers in Geometric Progression is 56. If we subtract 1, 7 and 21 from these numbers in that order, we obtain an Arithmetic Progression. Find the numbers. (5)

**Q35.** If  $\sin 2A = \alpha \sin 2B$ , then prove that  $\frac{\tan(A+B)}{\tan(A-B)} = \frac{\alpha+1}{\alpha-1}$  (5)

### SECTION E

**Q36.** In a library 25 students read Mathematics, Physics and Chemistry books. It was found that 15 students read Mathematics, 12 read Physics and 11 read Chemistry, 5 read Mathematics and Chemistry books, 9 read both Physics and mathematics while 4 read Physics and Chemistry books. 3 students read all the three subject books.



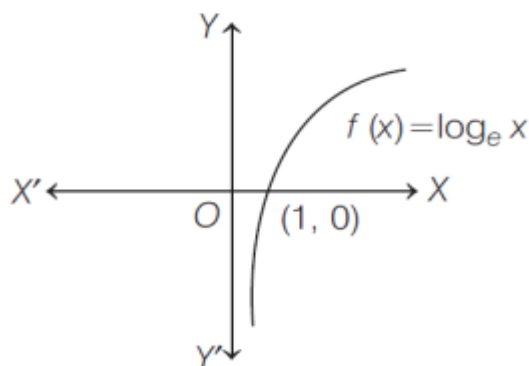
On the basis of the above information answer the following question:

(a) Find the number of students reading Chemistry books only. (1)

(b) Find the number of students reading only one of the subject. (1)

(c) Find the number of students reading none of the subject. (2)

**Q37.** The logarithmic function expressed as  $\log_e R_+ \rightarrow R$  and given by  $\log_e x = y$  iff  $e^y = x$ . The graph of the function is given below:



Domain of  $f(x)$  is  $R^+$  and range of  $f(x)$  is  $R$

On the basis of above information answer the following questions:

(a) Evaluate :  $\lim_{x \rightarrow 0} \frac{\log(1+6x) - 5x^2}{x}$  (1)

(b) Evaluate:  $\lim_{x \rightarrow 0} \frac{\sqrt{1+x} - 1}{\log(1+x)}$  (1)

(c) Evaluate:  $\lim_{x \rightarrow 0} \frac{\log(5+x) - \log(5-x)}{x}$  (2)

**Q38.** Five students Ajay, Shyam, Yojana, Rahul and Aakanksha are sitting in a playground in a line



Based on the above information answer the following questions:

(a) Find the total number of arrangements if “Yojana and Rahul are sitting at the extreme positions”. (1)

(b) Find the total number of arrangements if “Shyam is sitting in the middle”. (1)

(c) Find the total number of arrangements if “Ajay and Yojana sit together”. (2)