

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

DATE& DAY: MONDAY FEBRUARY 05, 2024

MAXIMUM MARKS: 80

TIME ALLOTTED: 3 HOUR

NAME: _____

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 $f(x) = \frac{x^2}{1+x^2}$, $x \in R$ is (1)
- (a) (0, 1)
 - (b) (0, 1]
 - (c) [0, 1)
 - (d) [0, 1]
- Q2.** The set of all natural number x such that $4x + 9 < 50$ in roaster form is (1)
- (a) {1, 2, 4, 6, 8, 10}
 - (b) {1, 3, 5, 7, 9}
 - (c) {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}
 - (d) None of the above
- Q3.** 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
- Q4.** If $\cot A = 4/3$ and A lies in III quadrant, then find the value of $\sec A$ is (1)
- (a) $1/4$
 - (b) $7/4$
 - (c) $2/4$
 - (d) $-5/4$

- Q5.** If $i^{103} = a + ib$, then $a + b$ is equal to (1)
- (a) 1
(b) -1
(c) 0
(d) 2
- Q6.** If $\frac{x-2}{x+5} > 2$, then $x \in$ (1)
- (a) (-12, 5)
(b) (-12, -5)
(c) (-5, 12)
(d) (5, 12)
- Q7.** 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) $\frac{9!}{3!2!7!}$
(b) $\frac{3!2!}{C(7,3)6!}$
(c) $\frac{2!}{C(7,4)8!}$
(d) $\frac{C(7,4)8!}{2!}$
- Q8.** $3^{1/2} \times 3^{1/4} \times 3^{1/8} \times \dots$ upto infinite terms is equal to (1)
- (a) 9
(b) 3
(c) 27
(d) 81
- Q9.** If the third term of GP is 4, then the product of its first 5 terms is (1)
- (a) 4^3
(b) 4^4
(c) 4^5
(d) 4^6
- Q10.** 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) $3y = -4x^2$
- Q11.** 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

- Q12.** The eccentricity of the hyperbola $x^2 - y^2 = 2004$ is (1)
(a) $\sqrt{3}$
(b) 2
(c) $2\sqrt{2}$
(d) $\sqrt{2}$
- Q13.** The probability of an event A occurring is 0.5 and B occurring is 0.3. If A and B are mutually exclusive, then the probability of neither A nor B occurring is (1)
(a) 0.9
(b) 0.7
(c) 0.1
(d) 0.2
- Q14.** 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
- Q15.** 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
- Q16.** 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
- Q17.** The domain and range of the function f given by $f(x) = 2 - |x - 5|$ is (1)
(a) Domain = R^+ , Range = $(-\infty, 1]$
(b) Domain = R , Range = $(-\infty, 2]$
(c) Domain = R , Range = $(-\infty, 2)$
(d) Domain = R^+ , Range = $(-\infty, 2]$

- Q18.** 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) $2^{15} - 1$

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)** If $n(A) = 3$, $n(B) = 6$ and $A \subset B$, then the number of elements in $A \cup B$ is 9. (1)
- Reason (R)** If A and B are disjoint, then $n(A \cup B)$ is $n(A) + n(B)$.
- Q20.** **Assertion (A)** If the numbers $\frac{-2}{7}$, K , $\frac{-7}{2}$ are in GP, then $k = \pm 1$. (1)
- Reason (R)** If a_1, a_2, a_3 are in GP, then $\frac{a_2}{a_1} = \frac{a_3}{a_2}$.

SECTION B

- Q21.** Find the domain and range of : $\sqrt{x^2 - 9}$ (2)
- Q22.** Evaluate: (2)
- $$\cos\left(\frac{3\pi}{2} + x\right) \cos(2\pi + x) \left[\cot\left(\frac{3\pi}{2} - x\right) + \cot(2\pi + x) \right]$$
- Q23.** Find the equation of the set of points which are equidistant from the points (1, 2, 3) and (3, 2, - 1). (2)
- Q24.** The number lock of a suitcase has 4 wheels, each labeled with 10 digits, i.e., from 0 to 9. The lock opens with a sequence of 4 – digits with no repeats. What is the probability of a person getting the right sequence to open the suitcase? (2)

- Q25.** Solve the given inequality for real x : (2)

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

SECTION C

- Q26.** Prove that : (3)

$$\tan 4x = \frac{4 \tan x (1 - \tan^2 x)}{1 - 6 \tan^2 x + \tan^4 x}.$$

- Q27.** Find $(a+b)^4 - (a-b)^4$. Hence, evaluate $(\sqrt{3} + \sqrt{2})^4 + (\sqrt{3} - \sqrt{2})^4$ (3)

- Q28.** 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)

- Q29.** Differentiate the following functions with respect to x : (3)

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

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

- Q30.** Out of 100 students, two sections of 40 and 60 are to be formed. If you and your friend are among the 100 students, what is the probability that you both will enter the same section? (3)

- Q31.** Find the number of non – zero integral solution of the equation $|1 - i|^x = 2^x$ (3)

SECTION D

- Q32.** Find the equation of the Circle which passes through the points (2, 3), (-1, 1) and whose centre lies on the line $x - 3y - 11 = 0$. (5)

- Q33.** If $\sin 2A = \alpha \sin 2B$, then prove that $\frac{\tan(A+B)}{\tan(A-B)} = \frac{\alpha+1}{\alpha-1}$ (5)

- Q34.** If a, b, c are in A.P. ; b, c, d are in G.P. and $\frac{1}{c}, \frac{1}{d}, \frac{1}{e}$ are in A.P. Prove that a, c, e are in G.P. (5)

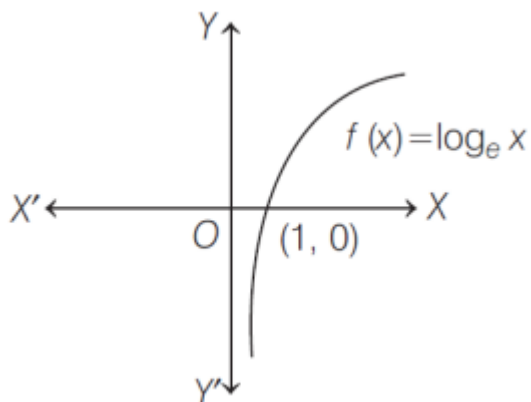
Q35. Find the mean deviation about the mean for the data given below:

(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

SECTION E

Q36. 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)

- Q37.** 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)

- Q38.** 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)