KOTHARI INTERNATIONAL SCHOOL, NOIDA
ANNUAL EXAMINATION, SESSION: 2024-25
GRADE: 11 SUBJECT: MATHEMATICS (041)
SET A

DATE& DAY: WEDNESDAY, FEBRUARY 05, 2025
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 based question of 4 marks*
- ***iii).*** *1 marks questions are MCQs.*
- ***iv).*** *2 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. If A and B are two sets, then A∩(A∪B) equals **(1)**
(a) A (b) B (c) ϕ (d) A∩B

Q2. The number of non-empty subsets of a set, containing n elements, is **(1)**
(a) n (b) n^2 (c) 2^n (d) $2^n - 1$

Q3. Which of the following statement is false? **(1)**
(a) A – B = A∩B′ (b) A – B = A – (A∩B)
(c) A – B = A – B′ (d) A – B = (A∪B) – B

Q4. Let R be a relation on N defined by R = $\{(x, y): x + 2y = 8,\ x, y \in N\}$. Then domain of R is **(1)**
(a) {2, 4, 8} (b) {2, 4, 6, 8} (c) {2, 4, 6} (d) {1, 2, 3, 4}

Q5. If $f(x) = x^3 - \frac{1}{x^3}$, then $f(x) + f\left(\frac{1}{x}\right)$ is equal to **(1)**
(a) $2x^3$ (b) $\frac{2}{x^3}$ (c) 0 (d) 1

Q6. If $f(x) = ax + b$, where a and b are integers, such that f(-1) = -5 nad f(3) = 3, then a and b are equal to **(1)**
(a) -3, -1 (b) 2, -3 (c) 0, 2 (d) 2, 3

Q7. The value of tan 1°.tan 2°.tan 3°…tan 89° is **(1)**
(a) 0 (b) 1 (c) ½ (d) not defined

Q8. Which of the following is not correct? **(1)**

(a) $sin\theta = -\frac{1}{5}$ (b) cos θ = 1 (c) sec θ = ½ (d) tan θ = 20

Q9. The value of tan 75° – cot 75° is **(1)**

(a) 2√3 (b) 4 (c) 1 (d) 0

Q10. If $-(x-3)+4 < 5-2x$, then x belongs to **(1)**

(a) (-∞, 2) (b) (-∞, -2) (c) (2, ∞) (d) (-2, ∞)

Q11. If $10 \leq -5(x-2) < 20$, then x belongs to **(1)**

(a) (-2, 0] (b) (-2, 0) (c) [-2, 0) (d) [-2, 0]

Q12. The number of triangles that can be formed by choosing the vertices from 12 given points, out of which 7 are collinear, is **(1)**

(a) 155 (b) 175 (c) 185 (d) 195

Q13. If $z = \frac{1+7i}{(2-i)^2}$, then |z| equals **(1)**

(a) ½ (b) 2 (c) 1/√2 (d) √2

Q14. If second term of a G.P. is 2 and the sum of its infinite terms is 8, then its first term is **(1)**

(a) 1/4 (b) 1/2 (c) 2 (d) 4

Q15. The coordinates of the foot of perpendicular drawn from the point P (3, 4, 5) on the yz-plane are **(1)**

(a) (3, 4, 0) (b) (0, 4, 5) (c) (3, 0, 5) (d) (3, 0, 0)

Q16. The value of $\lim_{x\to 0}(\sec x - \tan x)$ is **(1)**

(a) 0 (b) 1 (c) – 1 (d) 2

Q17. Evaluate: $\lim_{x\to 0}\frac{(1+x)^n-1}{x}$ **(1)**

(a) 1 (b) n (c) – n (d) 0

Q18. One card is drawn from a pack of 52 cards. The probability, that it is the card of king or spade, is **(1)**

(a) 4 / 13 (b) 1 / 13 (c) 1 / 26 (d) 17 / 52

Assertion – Reason based questions

In questions 8 and 9, 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:** If the third term of a G.P. is 4, then the product of its first five terms is 4^5. **(1)**
Reason: Product of first five terms os a G.P. is given as $a(ar)(ar^2)(ar^3)(ar^4)$

Q20. **(1)**
Assertion: $\lim_{x\to 0}\frac{\sin ax}{bx}=\frac{a}{b}$
Reason: $\lim_{x\to 0}\frac{\sin ax}{\sin bx}=\frac{b}{a}$ $(a, b\neq 0)$

SECTION B

Q21. (a) Find all pairs of consecutive even positive integers, both of which are larger than 8, such that their sum is less than 25. **(2)**

OR

(b) Solve the following for real x

$$\frac{x-1}{3}+4<\frac{x-5}{5}-2$$

Q22. Using binomial theorem, evaluate the following **(2)**
$\left(\sqrt{2}+1\right)^4+\left(\sqrt{2}-1\right)^4$

Q23. Find the locus of the point which is equidistant from the points A(0, 2, 3) and B(2, -2,1) **(2)**

Q24. (a) Differentiate the function $\frac{(2x+a)}{cosx}$ with respect to x. **(2)**

OR

(b) Differentiate the function $\frac{x^2+1}{x}$ with respect to x.

Q25. A and B are two events such that P(A) = 0.54, P(B) = 0.69 and P(A∩B) = 0.35, then find P(neither A nor B) **(2)**

SECTION C

Q26. Using Venn diagrams, prove that $(A\cap B)' = A'\cup B'$ **(3)**

Q27. Find the domain and range of the function $f(x)=\frac{ax+b}{bx-a}$ **(3)**

Q28. Let A = {1, 2, 3, 4, 5, 6}. Let R be a relation on A defined by R = {(a, b) : b is exactly divisible by a; a, b ∈A}, then **(3)**
(i) Write R in roster form.
(ii) Find the domain of R.
(iii) Find the range of R.

Q29. (a) Find the value of x, such that $\frac{3+2i\,sinx}{1-2i\,sinx}$ is purely imaginary. **(3)**

OR

(b) If α and β are different complex numbers with $|\beta| = 1$, find the value of $\left|\frac{\beta-\alpha}{1-\bar{\alpha}\beta}\right|$

Q30. In a school library, 5 Hindi novels and 5 English novels are available. A student has to select 4 novels out of them. In how many ways he can do it, if **(3)**

(i) he has to select 2 Hindi and 2 English novels

(ii) he has to select at least 2 Hindi novels

(iii) he has to select at least one novel from each language.

Q31. (a) Find the derivative of $\sqrt{\sin x}$ using first principal. **(3)**

OR

(b) Find the derivative of the following functions with respect to x:

(i) $(ax + b)^n . (cx + d)^m$

(ii) $\frac{\sin x + cosx}{\sin x - \cos x}$

SECTION D

Q32. If $sin\, x = -\frac{5}{13}$, x lies in III quadrant, find the values of **(5)**

$sin\frac{x}{2}$, $cos\frac{x}{2}$ and $tan\frac{x}{2}$.

Q33. (a) Find three numbers in G.P. whose sum is 13 and the sum of whose squares is 91. **(5)**

OR

(b) If a, b, c and d are different real numbers such that $\left(a^2 + b^2 + c^2\right)p^2 - 2(ab + bc + cd)p + \left(b^2 + c^2 + d^2\right) \leq 0$, then show that a, b, c and d are in G.P.

Q34. Show that the area of the triangle formed by the lines **(5)**

$y = m_1x + c_1$, $y = m_2x + c_2$ and $x = 0$ is $\frac{(c_1 - c_2)^2}{2|m_1 - m_2|}$.

Q35. Find the mean, variance and standard deviation using short-cut method **(5)**

Height in cm	70-80	80-90	90-100	100-110	110-120
No. of children	7	14	24	12	3

SECTION E

Q36. In a certain city, all telephone numbers have 6 digits. There are 3 telephone operator companies in the city to provide services. Each operator is allotted one specific non-zero digit to be used as first digit of the phone number of its company.

Based on above information, answer the following questions

(i) How many different phone numbers are available for each company? **(1)**

(ii) How many different phone numbers are there in all in the city? **(1)**

(iii) How many different phone numbers are there in the city if digits are not repeated? **(2)**

Q37. Some friends went on a picnic and after moving around and light snacks, they sat down and started playing with a pair of dice. Each time they throw the dice they asked other friends about the chance of getting the event which they have thought.

You can also try to help them out

(i) Find the probability of getting an odd number on the first die. **(1)**

(ii) Find the probability of getting the sum of numbers on two dice an even number. **(1)**

(iii) Find the probability of getting multiple of 3 on at least one die.

OR

(iii) Find the probability of getting a multiple of 2 on both the dice. **(2)**

Q38. A satellite is moving around the earth in the elliptic orbit, such that the earth is at one focus of the ellipse. The minimum and maximum distances of the satellite from the earth are 2000 km and 8000 km respectively.

Based on above information, answer the following questions:

(i) Find the distance of the earth from the centre of the elliptic orbit. **(2)**

(ii) Find the equation of the elliptic orbit, when centre is at the origin and focus is in x-axis. **(2)**