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

DATE& DAY: WEDNESDAY, FEBRUARY 05, 2025
MAXIMUM MARKS: 80   **TIME ALLOTTED: 3 HOUR**
NAME: _____   **ROLL NO: _____**

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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. Which of the following is empty set **(1)**

(a) $\{x: x^2-1=0, x\in \textbf{R}\}$ (b) $\{x:3x-1=0, x\in \textbf{R}\}$

(c) $\{x: x^2-2x+3=0, x\in \textbf{R}\}$ (d) none of these

Q2. Let A=$\{x: x\in R, x>4\}$ and B=$\{x: x\in R, x<5\}$.Then $A\cap B$ = **(1)**

(a) (4,5]   (b) (4,5)   (c) [4,5)   (d) [4,5]

Q3. The number of proper subsets of the set $\{a, \{1,2\},c\}$ are **(1)**

(a) 7   (b) 15   (c) 8   (d) 16

Q4. Let R be a relation in N defined by R = $\{(x, y) : x + 2y = 8\}$. The range of R is **(1)**

(a)$\{2, 4, 6\}$ (b)$\{1, 2, 3\}$ (c)$\{1, 2, 3, 4, 6\}$ (d) None of these

Q5. If R is a relation from a set P to set Q, then **(1)**

(a)$R \subset P \times Q$ (b)$R \subset Q \times P$ (c)$R = P \times Q$ (d) R = P U Q

Q6. The value of sin $(45° + \theta)$ – cos $(45° – \theta)$ is **(1)**

(a) 2 cosθ (b) 2 sinθ (c) 1   (d) 0

Q7. If cot x = 4/3 and x lies in third quadrant, then find the value of sec x. **(1)**

(a) 5/4   (b) –4/5   (c) 3/5   (d) –5/4

Q8. The modulus of the complex number $(4+3i)^2$ is equal to **(1)**

(a) 5   (b) 25   (c) 7   (d) 49

Q9. The third term of a geometric progression is 4. The product of the first five terms is **(1)**

(a) 4^3 (b) 4^5 (c) 4^4 (d) none of these

Q10. Line through the points (–2, 6) and (4, 8) is perpendicular to the line through the points (8, 12) and (x, 24). The value of x is **(1)**

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

Q11. The mean deviation about mean of the data 14, 15, 16, 17, 13 is: **(1)**

(a) 4   (b) 2.3   (c) 3   (d) 1.2

Q12. Value of $\lim\limits_{x \to 2} \dfrac{x^2-4}{x^2+x-6}$ **(1)**

(a) $-4/5$ (b) 0   (c) 4/5   (d) ½

Q13. Distance of the point P (6, 7, 8) from Y axis **(1)**

(a) 7   (b) 10   (c) 6   (d) 8

Q14. How many 4-digit numbers can be formed by using the digits 1 to 9, if repetition of digits is not allowed? **(1)**

(a) 3024   (b) 3026   (c) 3040   (d) 3014

Q15. Number of terms in expansion of $(4x^2-4x+1)^{12}$ is **(1)**

(a) 13   (b) 25   (c) 12   (d) 36

Q16. A bag contains 9 discs of which 4 are red, 3 are blue and 2 are yellow. The discs are similar in shape and size. A disc is drawn at random from the bag. Find the probability that it is either red or blue. **(1)**

(a) 2/9   (b) 7/9   (c) 1/9   (d) 4/9

Q17. The probability of getting 53 Tuesday in a leap year **(1)**

(a) 1/7   (b) 53/366   (c) 2/7   (d) 1/366

Q18. Solution of system of linear inequalities $3x - 7 < 5 + x$, $11 - 5x \leq 1$ is **(1)**

   (a) (2,6)   (b) {2,6}   (c) [2,6)   (d) (2,6]

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 (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): The value of $\theta = \pi/3$ or $2\pi/3$, when θ lies between $(0, 2\pi)$ and $\sin 2\theta = 3/4$. **(1)**

   Reason (R): $\sin \theta$ is positive in the first and second quadrant.

SECTION B

Q21. Let f = {(1,1), (2,3), (0,–1), (–1, –3)} be a function from Z to Z defined by $f(x) = ax + b$, for **(2)** some integers a, b. Determine a and b.

Q22. If A ={3, 6, 9, 12, 15, 18, 21}, B ={ 4, 8, 12, 16, 20 },C = { 2, 4, 6, 8, 10, 12, 14, 16 }, D = **(2)** {5,10, 15, 20 }; find (i)$A \cup B$ $(ii) B \cap C$ $(iii) C - D$ $(iv) B - A$

Q23. Show that tan 5x tan 3x tan 2x = tan 5x – tan 3x – tan 2x **(2)**

Q24. (a) In how many of the distinct permutations of the letters in MISSISSIPPI do the four I's come together? **(2)**

OR

   (b) How many words, with or without meaning, each of 2 vowels and 3 consonants can be formed from the letters of the word "EDUCATION"?

Q25. Evaluate $\lim_{x \to 0}(\text{cosec } x - \text{ cot } x)$ **(2)**

SECTION C

Q26. (a) Find domain and range of the function f defined as $f(x) = \frac{1}{\sqrt{x-5}}$ **(3)**

OR

(b) Find domain and range of the function f defined as $f(x) = \frac{3x-2}{x+2}$.

Q27. If the conjugate of $\frac{x+iy}{1-2i}$ is 1+i, then find the value of x + y   **(3)**

Q28. A man wants to cut three lengths from a single piece of board of length 111 cm.The second length is to be 3cm longer than the shortest and the third length is to be twice as long as the shortest. What are the possible lengths of the shortest board if the third piece is to be at least 5cm longer than the second?   **(3)**

Q29. (a) Using the binomial theorem, show that $6^n - 5n - 1$ is divisible by 25 for all natural value of n.   **(3)**

OR

(b) Expand $\left(x^2 + \frac{3}{x}\right)^5$ using binomial theorem.

Q30. Find the equation of the circle passing through the points (2, 3) and (–1, 1) and whose diameter is the line x – 3y – 11 = 0.   **(3)**

Q31. Find the equation of the set of points P, the sum of whose distances from A (0,5,0) and $B(0, -5,0)$ is equal to 20.   **(3)**

SECTION D

Q32. Prove that: $\sin^2 x + \sin^2\left(x - \frac{\pi}{3}\right) + \sin^2\left(x + \frac{\pi}{3}\right) = \frac{3}{2}$ **(5)**

Q33. (a) The sum of two numbers is 10 times their geometric means, show that numbers are in the ratio $(5 + 2\sqrt{6}) : (5 - 2\sqrt{6})$.   **(5)**

OR

(b) If a and b are the roots of $x^2 - 3x + p = 0$ and c, d are roots of $x^2 - 12x + q = 0$, where a, b, c, d form a G.P. Prove that $(q + p) : (q - p) = 17:15$.

Q34. Evaluate (a) $\lim_{x \to 0} \frac{\sin x - 2\sin 3x + \sin 5x}{x}$ (b) $\frac{d}{dx}\left(\frac{x + \cos x}{\tan x}\right)$ **(5)**

Q35. Calculate mean, Variance and Standard Deviation for the following distribution.   **(5)**

Classes	0-30	30-60	60-90	90-120	120-150	150-180	180-210
Frequency	2	3	5	10	3	5	2

SECTION E

Q36. Equation of straight line path is given by 2x+y-12=0. A man is standing at (2,3).He want to reach at straight line path travelling least distance. Find on the information above

(a) Slope of path travelled by man to reach on given path **(1)**

(b) Equation of path through which man should travel. **(1)**

(c) The coordinates of point on given path where man will reach. **(2)**

Q37. A selection Committee wants to select a National Team. Ina Sports group of 6 girls and 8 boys, in how many ways five children are to be selected for National team such that the team must have follow the conditions. Answer the following questions.

(a)Find the number of ways for selecting 2 girls & 3 boys.

(b) Find the number of ways for selecting 1 girl & 4 boys. **(2)**

OR

Find the number of ways such that there is no girl in 5 selected children. **(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)**