B K BIRLA CENTRE FOR EDUCATION

SARALA BIRLA GROUP OF SCHOOLS

A CBSE DAY-CUM BOYS' RESIDENTIAL SCHOOL

PERIODIC TEST-1 (2026-27)

MATHEMATICS (041)

SET-01

Class : XII Duration :1Hrs.

Date : 11/06/26 Max.Marks:25

Admission No.: Roll No:

General Instructions:

- This question paper consists of 5 sections: A, B, C, D, and E.
- Section A contains 6 questions of 1 mark each. All questions are compulsory.
- Section B contains very short questions of 2 marks each.
- Section C contains short answer questions of 3 marks each.
- Section D contains long answer question of 5 marks.
- Section E contains a case-study-based question OF 4 marks
- Use of calculator is not permitted.
- Draw neat diagrams wherever required.
- Show all necessary steps for full marks.
- Read all questions carefully before attempting.

SECTION A

1. A function $f : \mathbb{R} \to \mathbb{R}$ is defined as $f(x) = x^3 + 1$. Then the function has

a. No minimum value c. both maximum and minimum value

b. No maximum value d. neither maximum nor minimum values

1

2. If x is real , the minimum value at $x^2 - 8x + 17$ is

a. -1 c. 0

b. 0 d. 2

1

3. The function $f(x) = 2x^3 - 15x^2 + 36x + 6$ is increasing in the interval

a. $(-\infty, 2) \cup (3, \infty)$ c. $(-\infty, 2)$

b. $(-\infty, 2] \cup [3, \infty)$ d. $(3, \infty)$

1

4. Relation R on a set $A = \{1, 2, 3\}$ is defined as $R = \{(1, 1), (2, 2), (3, 3), (1, 2)\}$. According to the definition of a reflexive relation, which of the following is true?

1

a. R is reflexive because every element in A is related to itself.
b. R is not reflexive because (1, 2) is included in the relation.
c. R is reflexive because it contains at least one pair of the form (a, a).
d. R is not reflexive because it does not include all possible pairs in A × A.

5. In a group of students, a relation R is defined on $S = \{A, B, C\}$ where $(x, y) \in R$ means "x and y share the same hobby." If $R = \{(A, A), (A, B), (B, A)\}$, what can be said about R?

a. R is symmetric because if x shares a hobby with y, y shares it with x.
b. R is not symmetric because (C, C) is missing.
c. R is symmetric because it includes (A, A).
d. R is not symmetric because (B, C) is not included. **1**

6. This is a Assertion and Reason based question. Two statements are given, one labelled as Assertion (A) and the other is labelled as Reason (R). Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below.

a. Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).
b. Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).
c. Assertion (A) is true, but Reason (R) is false.
d. Assertion (A) is false, but Reason (R) is true. **1**

Assertion (A) : if the circumference of a circle is changing at the rate of $10\ cm/sec$ then the area of a circle changes at the rate $30\ cm^2/sec$, if the radius is 3 cm

Reason (R) : If A and r are the area and radius of the circle , respectively , then the rate of change of area of the circle is given by $\frac{dA}{dt} = 2\pi r \frac{dr}{dx}$.

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SECTION – {B}

(This section comprises of very short answer type questions (VSA) of 2 mark each)

7. Find the maximum and the minimum values , if any without using derivative of the fuction $f(x) = -(x-1)^2 + 2$ on $\mathbb{R}$. **2**

8. Let L be the set of lines in a plane and R be the relation in L , defined as $R = \{(L_1, L_2) : L_1 is\ perpendicular\ to\ L_2\}$. Check whether relation is Reflexive. **2**

SECTION – {C}

(This section comprises of short answer type questions (SA) of 3 mark each)

9. Aditi is making a circular dosa. she is spreading the dosa batter such that its radius is increasing at the rate of $2\ cm/sec$.

3

Find the rate of change of the area of the dosa, in terms of π , when the radius is 9 cm.

10. $a\ R\ b$ If $|a| \leq |b|$; where $a, b \in \mathbb{R}$, Check whether the following relation is reflexive, symmetric and transitive. **3**

SECTION – {D}

(This section comprises of Long answer type questions (LA) of 5 mark)

11. Find the absolute maximum and absolute minimum of function $f(x) = \sin x - \cos x$ on $[0, \pi]$.

SECTION – {E}

(This section comprises of CASE BASED questions (CBQ) of 4 mark)

12. In a social media platform, a group of users P = {Joshua, Miriam, Ruth, Samuel} is analyzed for their connection patterns. A relation R is defined on P where (x, y) ∈ R means "x follows y." The platform's algorithm records the following connections:

- Joshua follows himself (for profile updates). **4**
- Miriam follows herself and Joshua.
- Ruth follows Ruth and Samuel.
- Samuel follows Samuel and Joshua.
- Joshua follows Miriam.

Thus, the relation R is represented as $R = \{$(Joshua, Joshua), (Miriam, Miriam), (Miriam, Joshua), (Ruth, Ruth), (Ruth, Samuel), (Samuel, Samuel), (Samuel, Joshua), (Joshua, Miriam)$\}$.

Based on this case, answer the following question:

1. Check whether the following relation is reflexive .
2. Check whether the following relation is symmetric.
3. Check whether the following relation is transitive .