



# Delhi Public School, Howrah

PERIODIC TEST- I (2024 - 2025)

Class - XI

Care must be taken not to write anything on the question paper. All the questions must be attempted in the correct sequence.

Subject: - Applied Mathematics (Code No. - 241)

Time: 3 Hours

F.M.80

**General Instructions:**

1. This Question paper contains - five sections A, B, C, D and E. Each section is compulsory. However, there is some internal choice in some questions.
2. Section A has 18 MCQ's and 2 Assertion Reason based questions of 1 mark each.
3. Section B has 5 Very Short Answer (VSA) questions of 2 marks each.
4. Section C has 6 Short Answer (SA) questions of 3 marks each.
5. Section D has 4 Long Answer (LA) questions of 5 marks each.
6. Section E has 3 sources based/case based/passage based/integrated units of assessment (4 marks each) with sub parts.
7. Internal Choice is provided in 2 questions in Section-B, 2 questions in Section-C, 2 Questions in Section-D. You have to attempt only one alternative in all such questions.

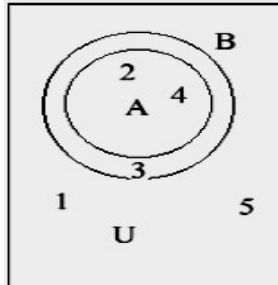
## SECTION A

**p-0.(All Questions are compulsory. No internal choice is provided in this section)**

- 1) The decimal equivalent of the binary number 10101 is 1  
(a) 21 (b) 12 (c) 22 (d) 31
- 2) The value of radix in decimal number system is 1  
(a) 21 (b) 12 (c) 8 (d) 10
- 3) The characteristic of logarithm of the number 43.84 is 1  
(a) 1 (b) 2 (c) 0 (d) -1
- 4) If  $\log_{\sqrt{3}} 27 = x$ , then the value of  $x$  is 1  
(a) 3 (b) 4 (c) 6 (d) 5
- 5) Jyoti alone can knit a sweater in 4 hours and Meera alone can knit a sweater in 6 hours. How much time would they take working together to knit one sweater? 1  
(a) 2 hours 40 minutes (b) 2 hours  
(c) 2 hours 24 minutes (d) None of these
- 6) The maximum gap between two successive leap years is 1  
(a) 4 (b) 8 (c) 2 (d) 1
- 7) The value of  $\sqrt[4]{(81)^{-2}}$  is 1  
(a)  $\frac{1}{9}$  (b)  $\frac{1}{3}$  (c) 9 (d)  $\frac{1}{81}$
- 8) In a day how many times a straight angle is formed between minute hand and hour hand of a clock? 1  
(a) 11 (b) 22 (c) 33 (d) 44
- 9) If a sphere and a cube have equal surface areas, then the ratio of the diameter of the sphere to the edge of the cube is 1  
(a) 1:2 (b) 2:1 (c)  $\sqrt{\pi}:\sqrt{6}$  (d)  $\sqrt{6}:\sqrt{\pi}$
- 10) A metallic sphere whose radius is 5 cm is melted and cast into the shape of a cylinder of radius 6 cm. Find the height of the cylinder. 1  
(a) 21.4 cm (b) 4.36 cm (c) 4.63 cm (d) 72.5 cm



- 11) Area (in  $\text{cm}^2$ ) of a rhombus whose diagonals are 8 cm and 6 cm is 1  
 (a) 48 (b) 24 (c) 12 (d) 120
- 12) If  $A = \{a, b\}$  and  $B = \{x, y, z\}$ , then the number of relations from  $B$  to  $A$  is 1  
 (a) 8 (b) 16 (c) 32 (d) 64
- 13) Number of proper subsets of a set containing 4 elements is 1  
 (a) 6 (b) 15 (c) 16 (d) 32
- 14) Which of the following is the set representing neither  $A$  nor  $B$ ? 1



- (a)  $\{1,5\}$  (b)  $\{2,4\}$  (c)  $\{2,3,4\}$  (d)  $\{\}$
- 15) If general term of an A.P. is  $3n$ , then find common difference. 1  
 (a) 2 (b) 3 (c) 5 (d) 6
- 16) The temperatures (in degrees Celsius) recorded over a week in Darjeeling are as follows: Monday:  $11^\circ\text{C}$ ; Tuesday:  $15^\circ\text{C}$ ; Wednesday:  $18^\circ\text{C}$ ; Thursday:  $12^\circ\text{C}$ ; Friday:  $17^\circ\text{C}$ ; Saturday:  $18^\circ\text{C}$ ; Sunday:  $x^\circ\text{C}$ . The average temperature for the week is  $20.5^\circ\text{C}$ . Calculate the temperature on Sunday. 1  
 (a)  $20.5^\circ\text{C}$  (b)  $30.7^\circ\text{C}$  (c)  $8^\circ\text{C}$  (d) None of these
- 17) In the A.P. 171, 162, 153, .....find the first non-positive term. 1  
 (a) 0 (b)  $-2$  (c)  $-6$  (d)  $-9$
- 18) The sum of first 16 terms of the AP: 10, 6, 2,... is \_\_\_\_\_. 1  
 (a)  $(-320)$  (b) 320 (c)  $(-352)$  (d)  $(-400)$

#### ASSERTION REASON BASED QUESTIONS

In the following questions, a statement of Assertion(A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices

- (i) Both A and R are true and R is the correct explanation of A.  
 (ii) Both A and R are true and R is not the correct explanation of A.  
 (iii) A is true but R is false.  
 (iv) A is false but R is true.

19) Assertion(A): A clock is showing the time as 3:15. The angle between the hour and minute hands of the clock is 7.5 degrees. 1

Reason(R): For every minute, the hour hand moves by 0.5 degrees.

- (a) (i) (b) (ii) (c) (iii) (d) (iv)

20) Assertion(A): In a non-leap year, the 1<sup>st</sup> of March is the same day of the week as the 1<sup>st</sup> of November.  
 Reason(R) : There are exactly 244 days between the 1<sup>st</sup> of March and the 1<sup>st</sup> of November in a non-leap year. 1

- (a) (i) (b) (ii) (c) (iii) (d) (iv)

#### SECTION B

**(All Questions are compulsory. In case of internal Choice, attempt any one question only)**

- 21) Convert the decimal number 10001 to the binary number. 2  
 22) (a) Write all the proper subsets of  $A$  where  $A = \{-3, -1, 0, 1, 4\}$ . 2

OR

(b) Let  $R$  be the relation on  $N$  defined by  $R = \{(a, b) : a \in N, b \in N \text{ and } a + 3b = 12\}$ , then evaluate the following: 2

(i) the elements of  $R$ .

(ii) the domain and range of  $R$ .

23) Find  $x$  and  $y$  if  $(4x + 3, y) = (3x + 5, -2)$ . 2

24) (a) A clock gains 4 seconds in 3 minutes and was set right at 9 a.m. What time will it show at 11:00 p.m. on the same day? 2

OR

(b) The average of four positive integers is 39. The highest integer is 73 and the lowest integer is 19. The difference between the remaining two integers is 18. Find the remaining integers. 2

25) If  $A$  is the arithmetic mean between  $a$  and  $b$ , then show that  $\frac{A+2b}{A-a} + \frac{A+2a}{A-b} = 4$ . 2

### SECTION C

**(All Questions are compulsory. In case of internal Choice, attempt any one question only)**

26) (a) If  $\frac{9^n \cdot 3^2 \cdot 3^n - (27)^n}{3^{3m} \cdot 2^3} = \frac{1}{27}$ , prove that  $m = 1 + n$ . 3

OR

(b) Solve for  $x$ :  $\log_2 x + \log_8 x + \log_{32} x = \frac{23}{15}$  3

27) The sums of  $n$  terms of two arithmetic progressions are in the ratio  $(5n + 4) : (9n + 6)$ . Find the ratio of their 18<sup>th</sup> terms. 3

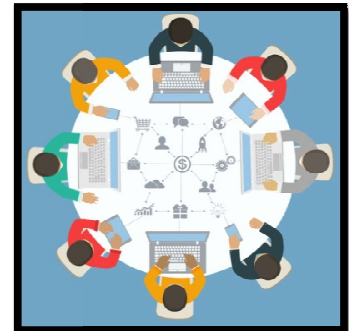
28) A market research group conducted a survey of 1000 people and reported that 720 people liked product A and 450 people liked product B. What is the least number of people that must have liked both the products? 3

29) (a) Eight friends P, Q, R, S, T, U, V and W are sitting around a circular table facing the centre. V is third to the right of Q and second to the left of R. Q is second to the left of T and immediate right of S. U is between Q and T. P is not at the left of R. Based on the above information, answer the following questions:

(i) Write the seating arrangement. 1

(ii) Who is exactly at the left of S? 1

(iii) Who is second to the right of T? 1



OR

(b) Two trains of length 110 m and 90 m are running in opposite directions at 40 km/hour and 50 km/hour respectively. In what time will they cross each other completely from the moment they meet? 3

30) A semi circular sheet of metal of diameter 28 cm is bent to form an open conical cup. Find the capacity of the cup. 3

31) A container shaped like a right circular cylinder having diameter 12 cm and height 15 cm is full of ice – cream. The ice – cream is to be filled into cones of height 12 cm and diameter 6 cm, having a hemispherical shape on the top. Find the number of such cones which can be filled with ice – creams. 3

### SECTION D

**(This section comprises of long answer type questions (LA) of 5 marks each)**

32) (a) If 15<sup>th</sup> February 2010 was Monday, what was the day on 10<sup>th</sup> January 2006? 5

OR

(b) What was the day on 26<sup>th</sup> August 1993? 5

33) Two finite sets have  $m$  and  $k$  elements. If the number of subsets of the first set is 112 more than the number of subsets of the second set, then find the values of  $m$  and  $k$ . 5

34) (a) A farmer buys a used tractor for ₹ 12000. He pays ₹ 6000 and agrees to pay the balance in annual installments of ₹ 500 plus 12 % interest on the unpaid amount. How much will the tractor cost him? 5

OR

(b) The sum of three numbers in A.P. is 24 and their product is 440. Find the numbers. 5

35) (a) If  $x = \sqrt[3]{28}$  and  $y = \sqrt[3]{27}$ , find the value of  $x + y - \frac{1}{x^2 + xy + y^2}$ . 3

(b) If  $\log x = 2.1647$ , then find the value of  $x$ . 2

### SECTION E

(This section comprises of 3 source based questions (Case Studies) of 4 marks each)

36) Case Study – 1 :

India is known for its cultural diversity, and this is reflected in the variety of festivals celebrated across the country. Some of the major festivals include Diwali, Holi and Eid. To understand the participation of students in these festivals, a survey was conducted among 140 students in a school. The results of the survey are as follows:



- 60 students celebrate Diwali.
- 70 students celebrate Holi.
- 75 students celebrate Eid.

- 42 students celebrate both Diwali and Holi.
- 18 students celebrate both Diwali and Eid.
- 30 students celebrate both Holi and Eid. Based on the above information, answer the following questions:

- (i) Find the number of students who celebrate only Diwali. 1
- (ii) Evaluate the number of students who celebrate Diwali and Holi but not Eid. 1
- (iii) How many students celebrate either Holi or Eid but not Diwali? 2



OR

(iv) Determine the number of students who celebrate exactly three festivals. 2

37) Case Study – 2:

"Biryani Bonanza" is a renowned restaurant in the heart of the city, famous for its wide variety of biryanis. In January 2024, the owner, Mr. Rizwan, decided to launch a new biryani flavor every month to keep the menu fresh and attract more customers. The new flavors are not only unique but also follow a pattern in their order growth, which Mr. Rizwan discovered to follow an arithmetic progression (AP). The biryani flavors introduced each month and their respective initial orders are as follows:



January: Hyderabad Delight - 60 orders; February: Lucknowi Luxury - increase by a fixed number of orders each month i.e. 20. March: Kolkata Classic; April: Mumbai Magic; May: Delhi Dhamaka; June: Chennai Charm; July: Malabar Marvel; August: Amritsari Azaadi; September: Kashmiri Kesar; October: Goan Grandeur; November: Punjabi Pataka; December: Rajasthani Royalty.

Mr. Rizwan noticed that the increase in orders each month forms an arithmetic progression.

Based on the above information, answer the following questions:

- (i) Suppose that during festive months (e.g., December), the number of orders for all biryanis increases by 50%. How would this affect the total number of orders in December 2024? 2
- (ii) Calculate the total number of orders for the first 12 months. 1
- (iii) Determine the total number of orders for the month of May. 1

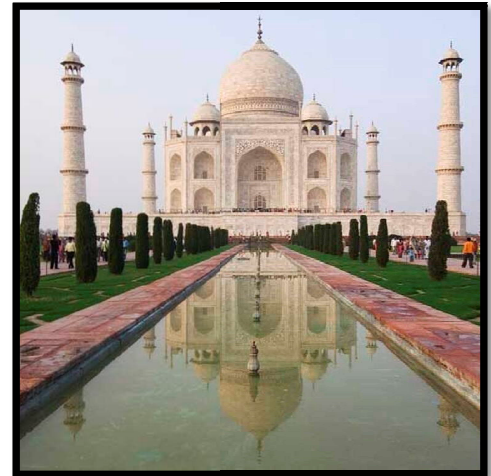
OR

- (iv) Assuming the current pattern continues, how many total orders will be placed by the end of the second year (24 months)? 1

**38) Case Study – 3 :**

The Archaeological Survey of India (ASI) is undertaking a comprehensive preservation project for the Taj Mahal. The project includes tasks such as cleaning the main dome, resurfacing the marble platform, and applying a protective coating to the exterior walls. The Taj Mahal has several geometric components, including the main dome, the four minarets, and the marble platform. The dimensions of the geometrical components are mentioned below:

- **Main Dome:** The main dome is a perfect hemisphere with a radius of 20 meters.
- **Minarets:** Each of the four minarets is a cylindrical structure with a height of 40 meters and a base diameter of 6 meters.
- **Marble Platform:** The square marble platform has a side length of 95 meters and a height of 1 meter.
- **Protective Coating:** A protective coating needs to be applied to the exterior surface area of the main dome and the minarets. Each liter of the coating covers 12 square meters. Hence, calculate the amount of protective coating needed for the main dome and the minarets. 4



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