ROLL NUMBER				

SET	A

INDIAN SCHOOL MUSCAT
HALF YEARLY EXAMINATION 2023
APPLIED MATHEMATICS (241)

CLASS : XI
DATE: 12.09.2023

TIME ALLOTED : 3 HRS.
MAXIMUM MARKS: 80

GENERAL INSTRUCTIONS:

1. This question paper contains **38** questions. **All** questions are **compulsory**.
2. This question paper is divided into **five** sections **A, B, C, D** and **E**.
3. **Section A** has 18 **MCQ's and 02** Assertion-Reason based questions of **1** mark each.
4. **Section B** has 5 **Very Short Answer (VSA)-type** questions of **2** marks each.
5. **Section C** has 6 **Short Answer (SA)-type** questions of **3** marks each.
6. **Section D** has 4 **Long Answer (LA)-type** questions of **5** marks each.
7. **Section E** has 3 **case study based questions of 4** marks each. Internal choice is provided in 2 marks questions in each case study.
8. There is no overall choice. However, an internal choice has been provided in some questions.

SECTION-A (MCQ)
(Questions 1 to 20 carry 1 mark each)

1. Find the odd one out of: 11, 16 , 23 , 29 , 37 , 46 , 56
   (a) 16 (b) 23 (c) 29 (d) 37

2. Average of four consecutive even numbers is 27. Find the largest number
   a) 24 (b) 30 (c) 28 (d) 40

3. The number of six-digit numbers that can be formed by using the digits 1, 2, 1, 2, 0, 2 is
   (a) 50 (b) 110 (c) 600 (d) 720

4. Distance between the two parallel lines $3x - 4y + 5 = 0$ and $6x - 8y + 14 = 0$ is
   (a) $\frac{7}{3}$ (b) $\frac{2}{5}$ (c) $\frac{8}{3}$ (d) $\frac{9}{5}$

5. A and B together can do a job in 4 days. If A alone can do the same job in 12 days, then how many days B alone take to complete the job?
   (a) 6 (b) 11 (c) 12 (d) 10

6. How many years will have 29 days in February from 2001 to 2100?
   (a) 25 (b) 26 (c) 24 (d) 20

7. Given that $\log 2 = 0.3010$ and $\log 3 = 0.4771$,then the value of $\log 60$ is
   (a) 0.7782 (b) 0.7781 (c) 1.7781 (d) 0.7780

8. The sum of an infinite G.P $\frac{-3}{4}, \frac{3}{16}, \frac{-3}{64}, \ldots$ is
(a) $\frac{3}{5}$ (b) $\frac{-3}{7}$ (c) $\frac{-7}{3}$ (d) $\frac{-3}{5}$

9. In binary number system, $1 + 1 + 1 + 1$ is equal to
(a) 10 (b) 100 (c) 1000 (d) 1111

10. If $B \subseteq A$ then $n(A \cap B)$ is equal to
(a) n(A) (b) n(B) (c) n(A) + n(B) (d) n(A) .n(B)

11. If for a sequence, sum of n terms is given by $S_n = 2(3^n - 1)$, then the fourth term is
(a) 48 (b) 18 (c) 108 (d) 36

12. If Sita's father is the only son of Divya's father-in-law, then Divya is the _____of Sita
(a) Daughter (b) Sister (c) mother (d) niece

13. Select the odd man out:
(a) Cricket (b) Billiards (c) Baseball (d) Fencing

14. Slope of the line $3x + 7y = 12$ is
(a) $\frac{7}{3}$ (b) $\frac{3}{7}$ (c) $\frac{-7}{3}$ (d) $\frac{-3}{7}$

15. If ${}^nC_{12} = {}^nC_8$, then find the value of ${}^nC_2$
(a) 190 (b) 180 (c) 20 (d) 380

16. Find 7th term from the end of the A.P. -5, -2, 1, 4, …, 85.
(a) 13 (b) -23 (c) 67 (d) 103

17. $(1011010)_2$ in decimal notation is
(a) 92 (b) 91 (c) 128 (d) 90

18. If $\log_{10}(3x + 1) = 2$, then the value of x is
(a) $\frac{1}{3}$ (b) 99 (c) 33 (d) $\frac{19}{3}$

ASSERTION AND 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.

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

19. Let A = {1, 2, 3} and B = {3, 8}
Assertion: $(A \cup B) \times (A \cap B) = \{(1,3), (2,3), (3,3), (8,3)\}$
Reason: $(A \times B) \cap (B \times A) = \{(3,3)\}$

20. **Assertion:** The points P (2,3), Q (1, -2) and R (-3, -8) are collinear
Reason: If the points P, Q and R are collinear, then their slopes are parallel.

SECTION – B (Questions 21 to 25 carry 2 mark each)

21. In a certain code WAND is written as TDKG and MODE is written as JRAH. How is HOST written in that code?

22. Two statements followed by two conclusions are given below. Which of the two conclusions is/are true on the basis of the given statements, disregarding commonly known facts.
Statements: (i) Some vegetables are fruits.
(ii) No fruit is black.
Conclusions: (I) Some fruits are vegetables.
(II) No vegetable is black.

23. Find three numbers in G.P whose sum is 28 and whose product is 512.

(OR)

If 4^{th} and 9^{th} terms of a G.P. be 54 and 13122 respectively, find the G.P.

24. How many words can be formed out of the letters of the word 'OBEDIENCE' so that vowels and consonants occur together?

(OR)

Find the number of ways of selecting 9 balls from 6 red balls, 5 white balls and 5 blue balls if each selection consists of 3 balls of each colour.

25. At what time between 8:00 and 9:00 will the hands of a clock be at right angles?

SECTION – C (Questions 26 to 31 carry 3 marks each)

26. Find the equation of the line passing through the point (5,2) and perpendicular to the line joining the points (2, 3) and (3, -1).

(OR)

Reduce the equation $2x - 3y - 5 = 0$ to (i) slope- intercept form (y-intercept form)
(ii) intercept form and also find its slope and y- intercept.

27. What will be the day of the week on 15^{th} August 2024? (Show the working)

28. Three numbers are in A.P. and their sum is 18. If the first two numbers are increased by 4 each and the third is increased by 36, the resulting numbers form a GP. Find the numbers.

29. In a certain code, @ implies DIVIDE, * implies SUBTRACT, $ implies MULTIPLY and # implies ADDITION, then find the value of: $\frac{1}{3}\ @\frac{8}{9}\ \$\ \frac{4}{5}\#\ (8)^{\frac{2}{3}}\ *\ 3^2$

30. Simplify without the use of log table: $\frac{8\log 2 - 2\log 4}{\log 2}$

(OR)

If $x^4y^3z = 2160$, then find the value of $x^2 + y^2 + z^2$

31. Let A= {1,2, 3,…,10}. Define a relation R on A by R ={(a, b): a – 2b = 0, a, b ∈ A} Depict the relation using roster form. Write down the domain and range of the relation.

SECTION – D (Questions 32 to 35 carry 5 marks each)

32. The following question has two statements and followed by two conclusions. Which of the two conclusions is/are true on the basis of the given statements. Also, draw the possible Venn diagrams for the two given statements.

STATEMENTS: I. Some cars are jeeps.
II. All trucks are cars.

CONCLUSIONS: I. No truck is jeep.
II. Some jeeps are car.

33. A person was drawing a monthly salary of ₹ 25000 in the 11^{th} year of service and a salary of ₹29000 in the 19^{th} year. Given that pension is half the salary at retirement time, find his monthly pension if he had put in 25 years of service before retirement. Assume that annual increment is constant.

(OR)

Mehul writes letters to four of his friends. He asks each one of them to copy the letter and mail to four different persons with the request that they continue the chain similarly. Assuming that the chain is not broken and it costs ₹2 to mail one letter. Find the total money spent on posting till the 8^{th} set of letters is mailed.

34. Evaluate using log tables: $\frac{(5.364)^3 \times (49.76)^{\frac{1}{2}}}{(83.45)^{\frac{1}{3}}}$

(OR)

Calculate the compound interest earned on ₹10 000 for 10 years at the rate of 8% per annum compounded half-yearly.

35. In class XI there are 200 students out of which 80 have taken Mathematics, 120 have taken Economics and 90 have taken Physical Education. If 50 have taken Mathematics and Economics, 60 have taken Economics and Physical Education, 40 have taken Mathematics and Economics. If 20 students have taken all three subjects, then on the basis of above information answer the following:

(a) Find the number of students who have taken at least one of the subjects.
(b) Find the number of students who has taken none of the subject.
(c) Find the number of students who have taken exactly one subject.
(d) Find the number of students who has taken Mathematics and Economics but not Physical Education.

SECTION – E- CASE STUDY (Questions 36 to 38 carry 4 marks each)

36. Five friends Rahul, Chetan, Ravi, Sunil and Pramod were playing in a ground, where they sit in a row in a straight line. On the basis of this, answer the following questions:

(i) In how many ways these five friends can sit in a row?

(ii) Find the total number of seating arrangements if Rahul and Chetan sit together.

(iii) What are the possible arrangements if Ravi and Sunil sit at the extreme positions?

(OR)

(iii) What are the possible orders, if Pramod is sitting in the middle.

37. Six friends- Preeti, Rupesh, Ashwini, Dipen, Rishi and Sachin are sitting in a circle facing inwards. Preeti and Ashwini are exactly opposite to each other. Sachin is in between Preeti and Dipen. Dipen is immediately to the left of Ashwini. Rishi is not exactly opposite to Dipen. Make a seating arrangement, with the help of it, answer the following questions.

(i) Who is sitting opposite to Dipen?

(ii) Who is just right to Ashwini?

(iii) Who are the neighbours of Dipen?

(OR)

(iii) Who are the neighbours of Preeti?

38. A triangular park has two of its vertices as B (-4, 1) and C (2,11). The third vertex A is a point dividing the line segment joining the points (3,1) and (6, 4) in the ratio 2:1.

Based on the above information, answer the following questions:

(i) Find the coordinates of third vertex A.

(ii) Find the equation of a line passing through B and C.

(iii) Find the equation of a line passing through A and parallel to BC.

(OR)

(iii) Find the equation of a line passing through A and perpendicular to BC.

******END OF THE QUESTION PAPER******