



GRADE: XI	<b>SAMPLE QUESTION PAPER FIRST TERM EXAMINATION (2023-24) APPLIED MATHEMATICS (241)</b>	<b>Marks: 80 Time: 3 HOURS</b>
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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 02 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 source based/case based/passage based/integrated units of assessment (04 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 alternatives in all such questions.

**SECTION A**

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

- 1) Write  $A = \{1,4,9,16,25\}$  in set builder form.
  - (a)  $A = \{x : x \text{ is a prime number}\}$
  - (b)  $A = \{x : x \text{ is the cube of a natural number}\}$
  - (c)  $A = \{x : x \text{ is the square of a natural number}\}$
  - (d)  $A = \{x : x \text{ is an even natural number}\}$
- 2) Let  $U = \{1,2,3,4,5,6,7,8,9,10\}$  ,  $A = \{1,2,5\}$  ,  $B = \{6,7\}$ . Then  $A \cap B'$  is:
  - (a) A
  - (b) B
  - (c)  $B'$
  - (d) None of the above

- 3) If  $(x-1, y+1) = (5, 6)$ , then the value of  $x$  and  $y$  is given by
- $x = 5, y = 5$
  - $x = 6, y = 5$
  - $x = 5, y = 6$
  - $x = 0, y = 0$
- 4) Let  $R$  be the relation in the set  $N$  given by  $R = \{(a, b) : a = b - 2, b > 6\}$ . Choose the correct answer.
- $(2, 4) \in R$
  - $(3, 8) \in R$
  - $(6, 8) \in R$
  - $(8, 7) \in R$
- 5) If  $A = \{1, 2, 3\}$  and  $B = \{3, 6\}$  then the number of relations from  $A$  to  $B$  is:
- $3^2$
  - $2^3$
  - $2 \times 3$
  - $2^6$
- 6) The domain of the function  $f = \{(1, 3), (3, 5), (2, 6)\}$
- 1, 3 and 2
  - $\{1, 3, 2\}$
  - $\{3, 5, 6\}$
  - 3, 5 and 6
- 7) The set  $\{x : x \in R, 2 < x < 3\}$  can be represented as:
- $(2, 3]$
  - $(2, 3)$
  - $\{2, 3\}$
  - $[2, 3]$
- 8) The  $n$ th term of a GP is :
- $r^n a$
  - $ar^{n-1}$
  - $ar$
  - $a^n r^{n-1}$
- 9) The third term of a GP is 4. The product of the five terms is:
- $4^3$
  - $44^4$
  - $4^5$

(d)  $4^6$

10) Three persons enter a railway carriage, where there are 5 vacant seats. In how many ways can they seat themselves?

- (a) 60                      (b) 70                      (c) 27                      (d) 25

11) The number of three digit odd numbers when repetition of digits is allowed:

- (a) 450                      (b) 360                      (c) 400                      (d) 420

12) The total number of 9 digit numbers which have all different digits is:

- (a)  $10!$                       (b)  $9!$                       (c)  $9 \times 9!$                       (d)  $10 \times 10!$

13) From a class of 36 students 3 students are to be selected to take part in a competition how many such selections can be made :

- (a) 7420                      (b) 7140                      (c) 5623                      (d) 5689

14) What is the value of  $\lim_{n \rightarrow 2} \left(1 + \frac{1}{n}\right)$

- (a)  $\frac{1}{2}$                       (b)  $\frac{3}{2}$                       (c)  $\frac{2}{3}$                       (d) 2

15) What is the value of the limit  $\lim_{x \rightarrow 4} \frac{x^2 - 4 - 3x}{x - 3}$

- a) 0  
b) 4  
c) 1  
d) Limit does not exist

16)  $\lim_{x \rightarrow 0} e^x$  is:

- (a) 1                      (b) 0                      (c) not defined  
(d) e

17) If  $y = \sqrt{x} + \frac{1}{\sqrt{x}}$ , then  $\frac{dy}{dx}$  at  $x=1$  is:

- (a) 1                      (b)  $\frac{1}{2}$                       (c)  $\frac{1}{\sqrt{2}}$                       (d) 0

18) The derivative of  $e^{5x+3}$  is

- (a)  $e^{5x+3}$                       (b)  $5 e^{5x+3}$                       (c)  $\frac{e^{5x+3}}{5}$                       (d)  $e^{5x}$

### 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

- Both A and R are true and R is the correct explanation of A.
- Both A and R are true and R is not the correct explanation of A.
- A is true but R is false.
- A is false but R is true.

19. Assertion (A) : 'The collection of all natural numbers less than 100' is a set.

Reason (R) : A set is a well-defined collection of the distinct objects.

20. Assertion (A) : The domain of the relation R is  $R = \{(x + 2, x + 4) : x \in N, x < 8\}$  is  $\{3, 4, 5, 6, 7, 8, 9\}$

Reason (R) : The range of the relation R is  $R = \{(x + 2, x + 4) : x \in N, x < 8\}$  is  $\{1, 2, 3, 4, 5, 6, 7\}$

### SECTION B

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

21). Write the interval  $(-2, 0)$  in set builder form and represent it on the number line.

OR

Write the following in roster form:

(a)  $R = \{(x, x^3) : x \text{ is a prime less than } 10\}$

(b)  $R = \{(x - 2, x^2) : x \text{ is a natural number less than } 5\}$

22) If  $A \times B = \{(0,2), (3, -1), (4,2), (0, -1), (3,2), (4, -1)\}$ , then find  $B \times A$ ?

23) Determine the 12<sup>th</sup> term of a GP whose 8<sup>th</sup> term is 192 and common ratio is 2.

24) A committee of 7 has to be formed from 9 boys and 4 girls. In how many ways can this be done when the committee consists of exactly 3 girls

25) Given  $y = e^x(x + 1)$ . Find the value of derivative at  $x = 1$

### SECTION C

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

26) Let  $U = \{x : x \in N \text{ and } x \leq 8\}$ ,  $A = \{x : 5 < x^2 < 50\}$  and  $B = \{x : x \text{ is prime}\}$ .

Find:

(1)  $A'$

(2)  $(A - B)'$

(3) Is  $A-B = A \cap B'$

OR

Let  $U$  = set of all natural numbers,  $A = \{x: x \text{ is an odd integer}\}$ ,  $B = \{x: x \text{ is an even integer}\}$  and  $C = \{x: x < 5\}$ . Find:

(1)  $(A \cup B)'$

(2)  $A-C$

(3)  $A - (B \cap C)$

27.) Find the domain of the following functions:

(1)  $f(x) = \sqrt{x-1}$

(2)  $f(x) = \frac{1}{\sqrt{5-x}}$

28) Examine the continuity of the following at  $x=2$

$$f(x) = \begin{cases} \frac{x^2 - 4}{x - 2}, & x < 2 \\ 4, & \text{otherwise} \end{cases}$$

29) If  $f(x) = \begin{cases} 1 + x^2, & 0 \leq x \leq 1 \\ 2 - x, & x > 1 \end{cases}$ , does  $\lim_{x \rightarrow 1} f(x)$  exist?

30) Find the derivatives of:

(1)  $\log(x + x^7)$

(2)  $(3x^2 - 1)(x^2 + 5x + 2)$

(3)  $\frac{x^2+1}{x^3-3x}$

31) Find the sum of the series  $7+77+777+7777+\dots$

OR

The 3<sup>rd</sup> and 8<sup>th</sup> term of a GP are 4 and 128 respectively. Find the G.P.

## SECTION D

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

32) Find three numbers in GP whose product is 216 and the sum of their product in pairs is 156.

**OR**

Given a GP with  $a = 729$  and 7th term is 64 determine  $S_7$ ?

**33)** Answer the following questions:

(1) how many odd numbers greater than 80000 can be formed using the digits 2,3,4,5 and 8 if each digit is used only once in a number ?

(2) in how many of the distinct permutations of the letters in MISSISSIPPI do the four I's not come together?

**OR**

What is the number of ways of choosing four cards from a pack of 52 playing cards?  
In how many of these cards are of the same suit?

**34)** Find the derivative of the following by using first principle:

(1)  $f(x) = \frac{1}{x}$

(2)  $f(x) = x^2$

**35)** If  $A = \{1, 2, \dots, 14\}$  and  $R$  is a relation from  $A$  to  $A$  defined by  $R = \{(x, y) : 3x - y = 0, x, y \in A\}$

(1) Write  $R$  in roster form

(2) Write its domain, range, codomain

(3) Draw the arrow diagram for  $R$

(4) Write its domain, range, codomain

### **SECTION E**

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

**36)** A state cricket authority has to choose a team of 11 members, to do it so the authority asks 2 coaches of a government academy to select the team members that have experience as well as the best performers in last 15 matches. They can make up a team of 11 cricketers amongst 15 possible candidates. In how many ways can the final eleven be selected from 15 cricket players if:

(i) there is no restriction.

(ii) one of them, who is in bad form, must always be excluded.

(iii) Two of them being leg spinners, one and only one leg spinner must be included?

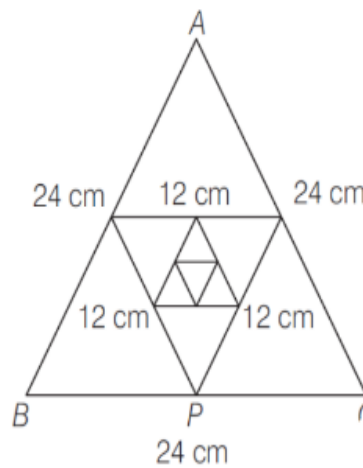
37) Two non-empty sets A and B are given by:  $A = \{x: x \text{ is a letter in } I \text{ LOVE MATHEMATICS}\}$  and  $B = \{x: x \text{ is a letter in } I \text{ LOVE STATISTICS}\}$ .

Based on the above information answer the following questions

- (i) Which of the following is true?  
 (i)  $A=B$  (ii)  $A \subset B$  (iii)  $B \subset A$  (iv) None of these
- (ii) Find  $A \cup B$
- (iii) Find  $A - B$

38)

Each side of an equilateral triangle is 24 cm. The mid-point of its sides are joined to form another triangle. This process is going continuously infinite.



Based on the above information answer the following questions:

- (1) What is the side of 5<sup>th</sup> triangle?
- (2) What is the perimeter of 1<sup>st</sup> triangle?
- (3) What is the sum of perimeters of first 6 triangles?