

**3/SEC-234 Syllabus-2023**

**2025**

( Nov-Dec )

**FYUP : 3rd Semester Examination**

**SKILL ENHANCEMENT COURSE**

**[ Analytical Thinking (Mathematics) ]**

**SEC-234**

*Marks : 56*

*Time : 2½ hours*

*The figures in the margin indicate full marks  
for the questions*

**SECTION—A**

Answer any four questions :

4×4=16

1. (a) If  $A = \{1, 2, 3, 4\}$ ,  $B = \{2, 4, 6, 9\}$  and  $C = \{3, 4, 5, 6\}$ , determine  $A \cap (B \cup C)$ . 2
- (b) If  $X = \{a, b, c\}$ , determine the power set of  $X$ . 2
2. (a) If  $A = \{1, 4\}$ ,  $B = \{4, 5\}$  and  $C = \{5, 7\}$ , determine the set  $(A \times B) \cup (A \times C)$ . 2

( 2 )

- (b) Let  $R$  be a relation on  $A = \{1, 2, 3\}$ , defined by  $(a, b) \in R$  if  $a \leq b$ . Is  $R$  a symmetric relation? Justify your answer. 2
3. (a) How many 2-digit numbers can be formed using the digits 1 to 9 when repetition is allowed? 2
- (b) Evaluate  ${}^nP_r$ , when  $n = 5$  and  $r = 3$ . 2
4. (a) When a coin is tossed three times, what is the sample space? 2
- (b) In a deck of 52 cards, what is the probability of drawing a red suit? 2
5. (a) Define a proposition with an example. 2
- (b) Express in symbolic form the proposition, "I will not carry an umbrella if it does not rain." 2
6. (a) What is a quantified statement? Cite one example. 2
- (b) What is the conclusion that can be derived from the two premises? 2
- Every student must appear for the examination to be promoted.
  - John did not appear the examination.

( 3 )

SECTION—B

Answer any four questions :

10×4=40

7. (a) Express the set  $A = \{x | x \text{ is an integer, } -3 < x < 3\}$  in roster form.  $2\frac{1}{2}$
- (b) Express the set  $B = \{-5, -4, -3, -2, -1, 0, 1, 2\}$  in set-builder form.  $2\frac{1}{2}$
- (c) For any two sets  $A$  and  $B$ , prove that  $(A \cap B)' = A' \cup B'$ . 5
8. (a) Let  $U$  be the universal set, and  $A \subset U$ . Define the complement of  $A$  and draw its Venn diagram. 2
- (b) Let  $U = \{x | x \text{ is a letter in English alphabet}\}$  be a universal set, and  $A = \{x | x \text{ is a vowel}\}$ . What is  $A'$ ? 2
- (c) Let  $\mathbb{Z}$  denote the set of integers, and the relation  $R$  in  $\mathbb{Z}$  be defined by  $(a, b) \in R$  if and only if  $a - b$  is an even integer. Show that  $R$  is an equivalence relation. 6
9. (a) How many arrangements can be made with the letters of the word 'TENNESSEE'? 5

- (b) A collection of 10 electric bulbs contains 3 defective ones. In how many ways can a sample of 4 bulbs be selected which contain 2 good bulbs and 2 defective ones? 5
10. (a) How many permutations can be made out of the letters of the word 'COMPUTER'? How many of these begin with 'C' and end with 'R'? 6
- (b) Find the probability of the occurrence of a number greater than 2 in a throw of a die, if it is known that only even numbers can occur. 4
11. (a) Using a truth table, show that  $\sim(p \Rightarrow q) \equiv p \wedge \sim q$ . 4
- (b) Express the statement, "There is a place in Meghalaya with lots of waterfalls", in symbolic logic notation. 3
- (c) Write the statement, "Neither Alice nor Bob passed the exam", in symbolic form and write its negation. 3
12. (a) Write the truth table of  $[(p \vee q) \wedge \sim q] \Rightarrow p$ . 4
- (b) Write the statement, "There exists water on Mars" in predicate logic notation. 3
- (c) Write the negation of "I won't be home tonight". 3

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