

3/SEC-234 Syllabus-2023

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(December)

FYUP : 3rd Semester Examination

SKILL ENHANCEMENT COURSE

[Analytical Thinking (Mathematics)]

SEC-234

Credit-3

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) Define a set. 2
(b) Find $A \cap B$, if

$A = \{x : x \text{ is an even integer}\}$
 $\text{and } B = \{0, 1, 2, 3, 4, 5, 6\}$ 2

2. (a) Verify the law : 2

$(A')' = A$, if $U = \{1, 2, 3, 4, 5, 6\}$ and $A = \{1, 6\}$

- (b) Draw the Venn diagram of $A - B$, if A
and B are any two sets. 2

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(Turn Over)

(2)

3. (a) Write the formula of $n!$ and hence evaluate the value of $5!$. 2
(b) Evaluate nC_r , where $n = 5$, $r = 3$. 2
4. (a) A coin is tossed once. Find the probability of getting a head. 2
(b) A die is rolled once. What is the probability of getting an even number? 2
5. (a) How can you express the statement, "Aristotle is a logician and he is from Greece" using symbolic form in propositional logic? 2
(b) Write the truth table of $p \Rightarrow q$, where p and q are any two propositions. 2
6. (a) What is a tautology? Cite one example. 2
(b) What is a contradiction? Cite one example. 2

SECTION—B

Answer any four questions : $10 \times 4 = 40$

7. (a) Define an equivalence relation on a set. 4
(b) Show that $R = \{(x, y) \in \mathbb{Z} \times \mathbb{Z} : x - y = 0\}$ is an equivalence relation. 6

8. (a) Define $A \Delta B$, for any two sets A and B . 3
- (b) Evaluate $A \Delta B$, if $A = \{3, 7, -1, 0\}$ and $B = \{2, 0, 3, 4\}$. 3
- (c) Is $A \Delta B = B \Delta A$ for any two sets A and B ? Justify. 4
9. (a) How many committees of five people can be chosen from six men and five women if exactly three men must be in each committee? 4
- (b) Consider the experiment of tossing two coins simultaneously. Let
- A be the event that a head occurs on the first coin
 - B be the event that a tail occurs on the second coin
- Prove that the events A and B are independent. 6
10. (a) How many arrangements can be made with the letters of the word STUDENT? 4
- (b) Write the formula of $(a+b)^n$, $n \in \mathbb{N}$ using binomial expansion. Use this formula to expand $\left(x + \frac{1}{x}\right)^5$. 2+4=6

11. (a) Using truth table, prove that $\sim(p \wedge q) \equiv \sim p \vee \sim q$. 4
- (b) Express the statement, "If it rains heavily, then everybody will remain indoor", in symbolic form. Additionally provide five different statements that are logically equivalent to it. 6
12. (a) Write the converse and contrapositive of the statement, "If there is water, then there is life". 4
- (b) Express the statement below in predicate logic : 3+3=6
- (i) All men are mortal.
- (ii) There exists a real number whose square is negative.
