2011

M.A.

4th Semester Examination

PHILOSOPHY

PAPER—PHI-2206

Full Marks : 40

Time : 2 Hours

The figures in the right-hand margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

[Advanced Logic]

Answer any *two* questions from Group—A and *one* question from Group—B

Group—A

1. (a) Which of the following statements are true (for all sets A, B, and C)?

(i) If $A \in B$ and $B \subset C$ then $A \subset C$.

(ii) $A \subseteq B$ and $B \subseteq C$ then $A \subseteq C$.

(iii) $A \notin B$ and $B \notin C$ then $A \notin C$. 2×3

(b) (i) Define empty set.

(ii) Show that the empty set is a subset of every set. 4

(c) What is wrong with the following argument?

Tomcats are cats.

Cats are species.

Therefore, tomcats are a species. 4

2. (a) (i) Give an example of sets A,B,C,D satisfying the conditions : 2

$A \subset B$

$B \in C$

$C \subset D$

$D = E$

(ii) Find the set of all subsets of the set {1, 2} 2

(b) Letting : $A = \{1\}$, $C = \{1, 2\}$, $E = \{1, \{1, \{1\}\}\}$

$B = \{1, \{1\}\}$, $D = \{1, 2, \{1\}\}$

(i) Which of the following statements are true?

$B \sim A \in D$

$E \sim B \subseteq A$ 1+1

(ii) Find the following :

$\{A\} \cap B$

$(\{A\} \cup D) \cap (E \sim C)$ 1+1

(c) (i) What is domain of individuals? Explain with examples. 2

(ii) Express the following notions in set theoretic notation:

The complement of A relative to B. the complement of set A relative to a domain of individuals. 1+1

(d) (i) If A is any set, what are the following?

$A \sim \Lambda$

$\Lambda \sim A$ 1+1

(ii) Draw a Venn diagram representing that.

$A \cup B \neq \Lambda$ and $A \cup \sim C \neq \Lambda$ 1+1

3. (a) Translate the following statements in terms of set theoretic symbols. (any *four*) : 2×4

(i) The apostles are twelve.

(ii) Fools and drunk men are truth tellers.

(iii) All coffee drinkers drink either tea or coffee.

(iv) A philosopher drinks neither tea nor coffee.

(v) No philosopher is a politician.

(vi) Women are human beings.

(b) Use Venn diagram to test whether the following assumptions are mutually consistent :

$C \neq \Lambda$

$A \cap B \neq \Lambda$

$A \cap C = \Lambda$

$(A \cap B) \sim C = \Lambda$ 4

(c) Use Venn diagram to test the validity of the following argument. State in terms of regions of the diagram whether the argument is valid or invalid :

All witnesses are prejudiced.

Some liars are not prejudiced.

$\therefore$ Some liars are not witnesses. 4

4. (a) Explain with example the notion of Cartesian product. 4

(b) What are the domain, counter domain and field of the relation of being a father? 4

(c) Classify the following relations according to the properties they do or do not have (e.g. reflexive, symmetric, not antisymmetric, not transitive etc.)

(i) The relation of being a grand father in the set of all persons.

(ii) The relation of being the same height in the set of all persons.

(iii) The relation of being a mother in the set of all persons.

(iv) The relation of loving in the set of all persons. 2×4

Group—B

5. (a) Letting :

A = The set of all positive integers. C = {2, 4}

B = {3, 5}, D = {1, 2}

Find the following :

$A \sim D$

$(B \cup C) \cap (B \cup D)$

$A \sim (C \cap D)$

$(A \sim C) \cup (A \sim D)$ 1×4

(b) Explain the following facts about the empty set :

(i) $(\exists A)\,(\Lambda \in A)\ \&\ (\exists A)\,(\Lambda \notin A)$

(ii) $(A)\,(A \subseteq \Lambda \leftrightarrow A = \Lambda)$ 2+2

6. Let, $A_1 = \{1, 2\}$

$A_2 = \{\Lambda\}$

$R = \{\langle 1, 2\rangle, \langle 2, \Lambda\rangle\}$

(a) Is R a subset of the Cartesian product $A_1 \times A_2$?

(b) Is D(R) a subset of A_1 ?

(c) Is C(R) a subset of A_2 ?

(d) Is F(R) a subset of $A_1 \cup A_2$? 2×4

7. (a) State the precise circumstances under which a relation is both symmetric and a symmetric in set A. 4

(b) Let $A = \{1, 2, \{1\}\}$

(i) Give an example of binary relation which is reflexive, symmetric but not transitive in A.

(ii) Give an example of binary relation which is reflexive, but neither symmetric nor transitive in A. 2+2