Specifically :

(i) For each a is a S, we have $a \in [a]$.

(ii) $[a] = [b]$ if and only if $(a, b) \in R$.

(iii) If $[a] \neq [b]$, then [a] and [b] are disjoint.

(OR)

2. *(a)* Prove $(A \times B) \cap (A \times C) = A \times (B \cap C)$. 2

(b) When is a relation R on a set A antisymmetric? 2

(c) Let $A = \{a, b, c\}$ and let R be defined by $R = \{(a,a), (a,b), (b,c), (c,c)\}$. Find transitive (R). 2

(d) Prove Theorem 3.1: Let A, B, C, D be sets. Suppose R is a relation from A to B, S is a relation from B to C, and T is a relation from C to D. Then ((R o S) oT) = (R o (S o T)). 4

3. *(a)* If $f: A \rightarrow B$ and $g: B \rightarrow C$, define composition of f and g. 2

(b) Prove Theorem 4·1 : Let $f: A \rightarrow B$, $g: B \rightarrow C$, and $h: C \rightarrow D$. Then (ho (g o f)) = ((h o g) o f)) 3

(OR)

4. When is a function said to be well-defined recursive function? Give an example of a well-defined recursive function. 3+2

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P.G Final Examination, 2025

(1st Year, 1st Semester)

Philosophy

Paper : PHIL/PG/1.2

Logic (Western)

Time : *Two Hours* *Full Marks* : 30

All questions carry equal marks.
Use two separate answer scripts for two groups.

Group A

1. *(a)* Construct a formal proof of validity for the following argument. 4

If there are any liberals, then all politicians are liberals. If there are any humanitarians, then all liberals are humanitarians. So, if there are any liberal humanitarians, then all politicians are humanitarians. (Lx : x is liberal, Px : x is a politician, Hx : x is a humanitarian).

(b) Prove the invalidity of the following argument : 4

$(x)\, Nx \supset (\exists y)\, Oy$

$(y)\; Oy \supset (\exists z)Pz / \therefore (\exists x)Nx \supset (z)Pz$

(c) What is wrong with the following arguments? 2

1. $(\exists x)\ Fx / \therefore (x)\ Fx$
2. Fc 1, E.I
3. (x)Fx 2, UG

OR

2. *(a)* Symbolize the following propositions using the suggested notation : 4

(i) Uneasy lies the head that wears a crown (Ux : x lies uneasy, Hx: x is a head, Cx : x is crown, Wxy : x wears y)

(ii) No one buys things from every store. (Px : x is a person, Sx : x is a store, Bxyz : x buys y from z)

(b) Construct demonstration for the following logical truth : 3

$[(A \vee B) \supset C] \supset \{[(C \vee D) \supset E] \supset [(A \supset E)\}$

(c) Construct a formal proof of validity for the following : 3

$(K \supset L) . (M \supset N)$

$(L \vee N) \supset \{[O \supset (O \vee P)] \supset (K . M)\} / . \therefore K \equiv M$

3. *(a)* How can we get a proposition from a propositional function? 2

(b) What is the difference between an ordinary CP and the Strengthened Rule of CP? Discuss with examples. 3

OR

4. Symbolize the following propositions using the suggested notation :

(a) Bees and wasps sting if they are either angry or frightened (Bx : x is a bee, Wx : x is a wasp, Sx : x stings, As : x is angry, Fx : x is frightened). 2

(b) A doctor who treats a person who has every ailment has a job for which no one would envy him. (Dx:x is a doctor; Px: x is a person, Txy: treats y, Ax: x is an ailment, Hxy:x has y, Jx: x is a job, Exyz:x envies y for his z). 3

Group B

1. *(a)* Find all partitions of S={a,b,c,d} 2

(b) Consider the set of words W ={sheet, last, sky, wash, wind, sit}. Find W / R where R is the equivalence relation defined by :

(i) "has the same number of letters",

(ii) "begins with the same letter". 2

(c) Prove Theorem 3.5. Let R be an equivalence relation on a set S. Then the quotient set S / R is a partition of S. 6