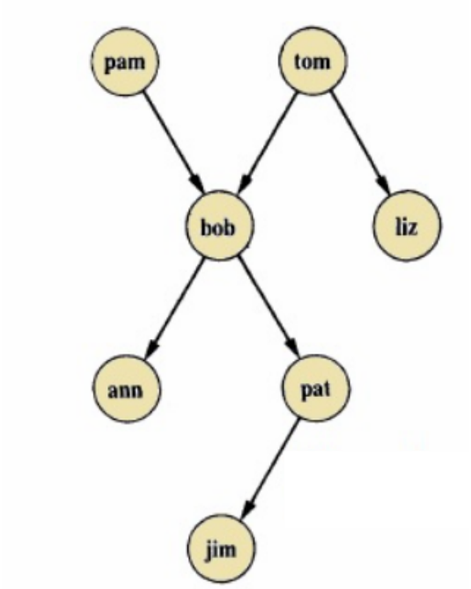
1.	(a)	State and explain rule of inferences with example. i) Modus Ponens ii) Modus Tollen iii) Hypothetical Syllogism iv) Disjunctive Syllogism
	(b)	Infer that the following argument is valid. i) If today is Tuesday, I have a test in Mathematics or Economics. If my Economics professor is sick, I will not have a test in Economics. Given, Today is Tuesday, and my Economics professor is sick. Therefore, I will have a test in Mathematics. ii) If the earth moves round the sun or the sun moves round the earth, then Copernicus might be a mathematician but wasn't an astronomer. Given, the earth moves round the sun , the sun doesn't moves round the earth, Copernicus might be a mathematician and Copernicus was an astronomer. iii) In spite of having French nationality, B. Russel was a critic of imperialism, then either he was not a bachelor or he was a universal lover. Given, B. Russel wasn't French, Russel was a critic, Russel was married and was universal lover. iv) Given, Every student is sincere All who are sincere and hard worker will succeed in their career. Meena is hard worker. Meena is student. Prove: Will Meena Succeed in her career
	(c)	(i) Simplify the propositional statement, (. (ii) Proof that, statements P→(Q∨R) and (P→Q)∨(P→R) are logically equivalent.
2.	(a)	Explain different components of prolog along with the block diagram.
	(b)	Briefly discuss the syntax rules of Prolog.
	(c)	 Given family tree. Construct knowledge base and rules so that we can answer the following quires: i) father (X, Y) ii) mother (X, Y) iii) parent (X,Y) iv) grandparent(X, Y) v) brother (X, Y) vi) sister (X, Y) vii) wife(X,Y) viii) uncle (X,Y) Write corresponding prolog statements and quires for the given family tree.
	(d)	Determine the output of the prolog statements:

		(i) my_last(X,[a,b,c,d]). (ii) element_at(X,[a,b,c,d,e],3). (iii) my_flatten([a, [b, [c, d], e]], X). (iv) compress([a,a,a,a,b,c,c,a,a,d,e,e,e,e],X). (v) encode([a,a,a,a,b,c,c,a,a,d,e,e,e,e],X). (vi) drop([a,b,c,d,e,f,g,h,i,k],3,X). (vii) split([a,b,c,d,e,f,g,h,i,k],3,L1,L2). (viii) range(4,9,L).
	(e)	Here is a tiny lexicon (that is, information about individual words) and a mini grammar consisting of one syntactic rule (which defines a sentence to be an entity consisting of five words in the following order: a determiner, a noun, a verb, a determiner, a noun). word(determiner,a). word(determiner,every). word(noun,criminal). word(noun,'big kahuna burger'). word(verb,eats). word(verb,likes). sentence(Word1,Word2,Word3,Word4,Word5):- word(determiner,Word1), word(noun,Word2), word(verb,Word3), word(determiner,Word4), word(noun,Word5). a) What query do you have to pose in order to find out which sentences the grammar can generate? b) How many sentences can be generated? c) List all sentences that this grammar can generate in the order that Prolog will generate them.
3.	(a)	Answer any five of the following questions.
		i) Briefly describe the concept of *Artificial Intelligence*. List out the advantages and uses of AI in our day-to-day activities.
		ii) Define knowledge. List out different knowledge representation techniques. Differentiate between a conventional program and a knowledge-based system.
		iii) Distinguish between universal and existential quantifiers.
		iv) Define and list out some advantages and disadvantages of the following terms: • Propositional logic • Predicate logic.
		v) Distinguish between satisfiable, contradiction, valid and equivalence with example.
	(b)	Convert the following statements into predicate logic. i) Father of Rita and Father of Mina are friends. ii) All the flowers are beautiful. iii) All man is mortal. iv) All employees earning TK. 30,000 or more per year pay taxes. v) There is something small and slimy on the table. vi) Every race has a winner. vii) Sajjad likes everyone who is tall. viii) Rita doesn't like anyone who prefers arguments.

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Good Luck