13.2 Knowledge and reasoning

Name: _____ Class: _____ Date: _____ **Total: 24 marks**

KEY WORDS inference • forward chaining

Objective

Chain both directions and prove by refutation.

1 Key knowledge and worked examples

■ The KB

F1 Storm; F2 Weekend; R1 Storm → Delayed; R2 Weekend → HeavyTraffic; R3 HeavyTraffic → Delayed; R4 Delayed → RefundRisk ✓.

■ Worked example: both chains

Forward: wave one derives Delayed and HeavyTraffic; wave two RefundRisk. Backward from RefundRisk: R4, R1, fact – three steps ✓.

2 Practice

2.1 Which chaining direction is goal-directed? [3]

2.2 What rule makes every step sound? [3]

2.3 State the converse error with $P \to Q$. [3]

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3 Exam-style questions

3.1 Add to the KB: F3 Weekend is false (a weekday); R5 Delayed → Compensated; R6 Compensated → RefundRisk.

Run forward chaining to closure: list each wave's new facts. State whether R2 ever fires and why. Give the backward chain for Compensated, naming each rule applied. State the total derived facts at closure. [8]

3.2 Prove RefundRisk by refutation.

Write the assumption. Apply rules (contrapositives where needed) until the empty clause or a direct contradiction with a fact. State which proof the course KB makes shorter – forward or refutation – and why. Name the solver family built on this machinery. [7]

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