

IIT JODHPUR

Minor Examination: EEL7698 AI for EDA (Sept'25): TAKE-HOME

Guidelines (Total time: ~48 Hours, Maximum Marks: 20):

- Please read the question paper very carefully .
 - **Evaluation will be strictly done on the originality of answers, NOT on the basis of completeness. LLM tools can provide completeness, but answers from these tools may not be original.**
 - **UG students:** Attempt any 2 questions out of Question-4,5,6.
 - **Students other than UG batch:** Attempt any 2 questions out of Question-1,2,3.
 - All questions carry 10 marks each. **Assume any required data/dataset in each question.**
 - Please refer to Assignment for further details for few questions.
 - All answers must be typed and supported by Python Jupyter Notebooks, wherever applicable.
 - **Answers MUST be as detailed as much as possible.**
 - **Usage of all references (including different LLMs) MUST be properly acknowledged failing which penalty marks would be awarded.**
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1. Given a few ASIC synthesis targets (such as area of ASIC, approximate power and operational frequency), develop a methodology using supervised/unsupervised/transfer/reinforcement learning for converting hierarchical behavioral RTL design into structural format (netlist)? Which methodology would you use as you know that the dataset (if any) available to you is highly limited? Show the complete procedure with a dummy dataset and all details?
 2. Develop a methodology using supervised/unsupervised/transfer/reinforcement learning for proving the equivalence of two different versions of hierarchical behavioral RTL representation of the same design? For proving equivalence, it is essential to show that both the versions of the designs produce same logical outputs given the same inputs. This can be solved through conventional algorithms, however, problem is that these algorithms have very high complexity. Hence, you need to answer how a ML/DL/AI approach can be alternative to the conventional approaches.
 3. For simulation-based verification of digital systems, we deploy regression test suites (means thousands of test cases). It is a typical statistic that out of 50,000 test cases, 500 test suites (1%) are highly effective, capable of exposing the bugs in the hierarchical behavioral RTL designs, while the other 99% are quite ineffective. The problem, however, is that we do not know which are those effective test cases. Devise a methodology using supervised/unsupervised/transfer/reinforcement learning for achieving this test case identification?
 4. Compare the effectiveness of multiple AI techniques for solving the problem mentioned in Question no. 1 above and also mention the runtime estimates of these techniques for CPU, GPU.
 5. Compare the effectiveness of multiple AI techniques for solving the problem mentioned in Question no. 2 above and also mention the runtime estimates of these techniques for CPU, GPU.
 6. Compare the effectiveness of multiple AI techniques for solving the problem mentioned in Question no. 3 above and also mention the runtime estimates of these techniques for CPU, GPU.
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