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Question Paper Code : 81157

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2025.

Third Semester

Computer Science and Engineering

CS 3351 — DIGITAL PRINCIPLES AND COMPUTER ORGANIZATION

(Common to : Computer Science and Design/Computer Science and Engineering (Artificial Intelligence and Machine Learning)/Computer science and Engineering (Cyber Security)/Computer and Communication Engineering /Electrical and Computer Engineering/Artificial Intelligence and Data Science/Computer Science and Business Systems/Information Technology)

(Regulations 2021)

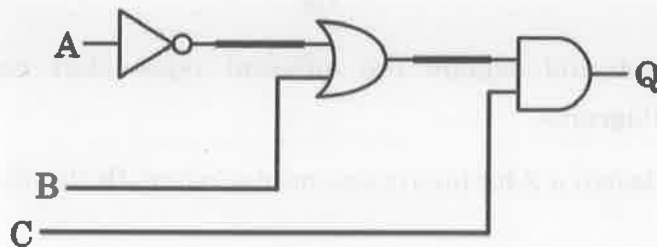
Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Differentiate between Combinational and Sequential circuits.



2. Convert the above logic circuit into NOR gates only.
3. State the difference between Synchronous and Ripple counters
4. Draw the characteristic Table of a JK flip-flop.
5. Mention the role of memory location in instruction execution.
6. Differentiate between direct and indirect addressing.
7. Define data path.

8. List the causes a control hazard.
9. List any two cache mapping techniques.
10. Draw the circuit diagram of DMA (Direct Memory Access).

PART B — (5 × 13 = 65 marks)

11. (a) (i) Explain the construction and working of a 4-bit magnitude comparator. (7)
- (ii) Minimize the following function using K-Map and design a circuit:

$$F = \Sigma(0, 2, 4, 5, 8, 9, 12) + d(1, 7, 13)$$
 (6)

Or

- (b) (i) Construct a 4 to 16 line decoder with an enable input using 2 to 4 line decoders with enable inputs. (7)
- (ii) Draw a 4-bit binary adder-subtractor circuit using full adders and an XOR gate. (6)
12. (a) (i) Design a simple sequence detector using both Moore and Mealy models. (7)
- (ii) Illustrate the process of state minimization in sequential circuit design with an example. (6)

Or

- (b) (i) List and explain the different types shift registers with block diagrams. (7)
- (ii) Design a 2-bit binary up-counter using JK flip-flops. (6)
13. (a) (i) With neat sketch explain the Von Neumann architecture. (7)
- (ii) Explain in detail about Encoding of Machine Instruction with suitable example. (6)

Or

- (b) Describe the various addressing modes used in modern computers with suitable examples.

14. (a) (i) Describe the various steps involved in instruction execution cycle. (7)
(ii) With a neat block diagram, explain the working of a microprogrammed control unit. (6)

Or

- (b) (i) Draw and explain a basic instruction pipeline with 5 stages. (7)
(ii) Describe delayed branching as a method to handle control hazards. (6)
15. (a) (i) With a neat diagram, explain the functioning of memory management in a system using segmentation and paging. (7)
(ii) Explain the three cache mapping techniques with examples. (6)

Or

- (b) (i) Discuss the concept of virtual memory with suitable scenario. (7)
(ii) List and explain any two interconnection standards. (6)

PART C — (1 × 15 = 15 marks)

16. (a) (i) Design the combinational circuit with 3 inputs and 1 output. The output is 1 when the binary value of the input is less than 3. The output is 0 otherwise. (10)
(ii) Design the circuit by using NAND gates $F = ABC' + DE + AB'D'$. (5)

Or

- (b) Design a modulo-6 counter using JK flip-flops.

