INTERNATIONAL CENTRE FOR APPLIED SCIENCES
MAHE, MANIPAL
B.Sc. (Applied Sciences) in Engg.
End – Semester Theory Examinations – May 2021- Repeaters 2018 Batch
III SEMESTER- SWITCHING CIRCUITS AND LOGIC DESIGN (ICS 232)
(BRANCH: CSE)

Time: 3 Hours **Date: 28 May 2021** **Max. Marks: 100**

- ✓ **Answer ANY FIVE full Questions.**
- ✓ **Missing data, if any, may be suitably assume.**
- ✓ **Plagiarism in any form will invite penalty of marks.**

1. Solve the following using appropriate identities and axioms in switching algebra. Mention the identity/theorem/axiom used. **(20)**

A Prove that:

i. $abd + a'bc + bcd = abd + a'bc$

ii. $(a + b + d)(a' + b + c)(b + c + d + e + f) = (a + b + d)(a' + b + c)$

B. Simplify :

i. $\overline{[(a + d)'.(b' + c)']}$

ii. $(x + y).\overline{[x'.(y' + z')]} + x'y' + x'z'$

2. Answer the following. Use circuit diagrams, examples, wherever required. **(20)**

A. Discuss the power dissipation in PMOS and NMOS transistors.
Examine how the power is dissipated in PMOS transistors with suitable circuit diagram.

B. Simplify the circuit shown in the Fig 2.1 using algebraic manipulation.
Illustrate a stepwise conversion of the circuit in Fig 2.1 using only circuit diagrams.
Perform a cost analysis on the original and final circuit obtained.

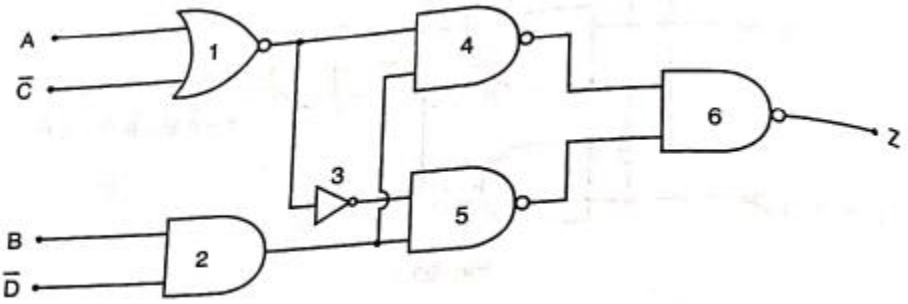

Fig 2.1

3. Based on the circuit diagram given in Fig 3.1, answer the following questions: **(20)**

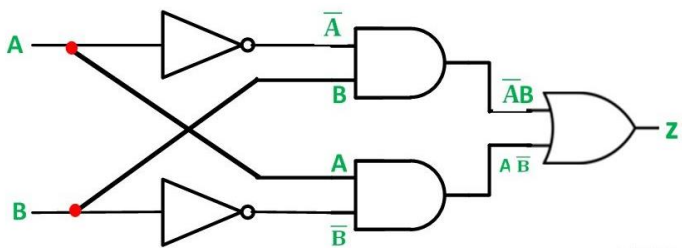

Fig. 3.1

A. Convert the above circuit to an equivalent circuit comprising of a single type of gate. Implement the above circuit in CMOS.

B. Calculate how many transistors are required for the circuit to function.
Perform a cost analysis on the CMOS circuit.
Suggest any 2 solutions to make the circuit cost efficient.

4. Explain the following terms with reference to switching algebra and circuit design. Include diagrams and switching equations to support your answer. **(20)**

A. Analysis and Synthesis
B. Consensus Theorem and Principle of Duality

5. Answer the following questions. Give appropriate examples and neat diagrams to support your answer. **(20)**

A. Explain use of PMOS and NMOS transistors in CMOS circuits. What are the advantages of using CMOS transistors in circuit design?

B. Explain power dissipation in CMOS transistors with the help of an appropriate example. Explain concept of fan-in and fan-out with the help of an appropriate example. How does the power dissipation vary in CMOS as compared to that in NMOS transistors?

6. With the help of neat diagrams and relevant description, explain the following technologies: **(20)**

A. Programmable Logic Array
Programmable Array Logic
B. Field Programmable Gate Arrays
Transmission Gates

7. Explain the following concepts, with relevant examples, circuit diagrams and applications to support your answer. **(20)**

A. Pull up and Pull Down Network in CMOS
B. Fan in , Fan out and Noise Margin

8. Convert a basic gate circuit of your choice into a circuit of the following type. The circuit selected should have at least 4 logic gates. Explain each and every step in the conversion to the final circuit. Add suitable switching expressions to support your answer. **(20)**

A. NOR only logical network
B. NAND only logical network

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