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Roll No. \_\_\_\_\_

Total No. of Pages: **2**

**7E1827**

**B. Tech. VII - Sem. (Main / Back) Exam., Nov-Dec 2025  
Electronics & Communication Engineering  
7EC5-11 Program Elective VLSI Design**

**Time: 3 Hours**

**Maximum Marks: 70**

*Instructions to Candidates:*

*Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.*

*Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.*

*Use of following supporting material is permitted during examination.  
(Mentioned in form No. 205)*

1. NIL

2. NIL

**PART - A**

**[10×2=20]**

**(Answer should be given up to 25 words only)**

**All questions are compulsory**

- Q.1 Write  $I_D - V_{DS}$  relation in linear and saturation region of MOS transistor.
- Q.2 What is body effect in MOSFET? How threshold voltage changes with it?
- Q.3 Draw transfer characteristics of enhancement mode & depletion mode NMOS transistors.
- Q.4 What is Sub-threshold conduction in MOS?
- Q.5 What are SWAMI and channel stop implant in CMOS fabrication process?
- Q.6 Draw twin-well CMOS process cross section.
- Q.7 What is 'DRC rules'? State types of DRC rules.
- Q.8 Draw 4T DRAM cell depicting read and write lines.
- Q.9 What is DOMINO logic circuit?
- Q.10 Write modeling styles used in VHDL.

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## **PART – B**

[5×4=20]

### **(Analytical/Problem solving questions)**

#### **Attempt any five questions**

- Q.1 Draw MOS transistor small signal model. Find the low-frequency model parameters for an n-channel MOS transistor that has doping concentrations of  $N_D = 10^{25}$ ,  $N_A = 10^{22}$ ,  $\mu_n C_{ox} = \frac{92\mu A}{V^2}$ ,  $\frac{W}{L} = \frac{20}{2}$ ,  $V_{GS} = 1.2$  V,  $V_{tn} = 0.8$  V, and  $V_{DS} = V_{eff}$ . Assume  $\gamma = 0.5 \sqrt{V}$  and  $V_{SB} = 0.5$  V. What is the new value of  $r_{ds}$  if the drain-source voltage is increased by 0.5V?
- Q.2 Sketch Euler path and CMOS implementation of the given Boolean expression; also determine equivalent transistor sizes for pull-up and pull-down circuits.  $\bar{Y} = (\bar{A} + BC). (\bar{C} + D)$
- Q.3 Discuss (i) Punch through (ii) Hot electron effect (iii) Narrow channel effect in MOS transistor
- Q.4 Discuss power dissipation in CMOS circuits. Calculate the short-circuit and dynamic power dissipation in a CMOS circuit operating at  $V_{DD} = 5$ V at 100MHz with internal switched capacitance 300pF with average rise/fall time is 200ps.
- Q.5 Discuss Voltage Transfer Characteristics (VTC) of CMOS inverter with on-off state of transistors in each region.
- Q.6 What is ASIC? Depict VHDL and FPGA based implementation steps of ASICs.
- Q.7 Discuss transmission gate with I/O characteristics. Implement 2×1 multiplexer using transmission gate and draw its layout.

## **PART – C**

[3×10=30]

### **(Descriptive/Analytical/Problem Solving/Design Questions)**

#### **Attempt any three questions**

- Q.1 Design the following logic circuits using CMOS logic gate, draw layout diagram and mark all the size/spacing using  $\lambda$ -based rules  
(a) 3-input NOR gate (b) JK - Flip-flop
- Q.2 Sketch and describe logic circuit realized using (a) Clocked CMOS logic (b) NP (ZIPPER) logic
- Q.3 Write the factors affecting the noise margin of CMOS inverter. Calculate the noise margin for CMOS inverter operating at 3.3V with  $V_{tn} = 0.07$ V,  $V_{tp} = -0.07$ ,  $\beta_n = \beta_p$ .
- Q.4 Explain physical origin of Latch-up in CMOS, with the help of model and V-I characteristics.
- Q.5 Write VHDL code for (i) SR - flip-flop (ii) 4×1 Multiplexer



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B. Tech. VII - Sem. (Main / Back) Exam., Nov-Dec 2025

Open Elective - I

7AG6-60.2 Environmental Engineering and  
Disaster Management

Time: 3 Hours

Maximum Marks: 70

*Instructions to Candidates:**Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.**Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.**Use of following supporting material is permitted during examination.  
(Mentioned in form No. 205)*1. NIL2. NIL**PART - A**

[10×2=20]

**(Answer should be given up to 25 words only)****All questions are compulsory**

- Q.1 State the per capita domestic water requirement for urban and rural areas in India.
- Q.2 List two main sources of surface water supply.
- Q.3 What is the function of intake structure?
- Q.4 State the desirable values/range of pH, TDS, NO<sub>3</sub> and turbidity as per BIS standards for drinking water.
- Q.5 Define BOD of wastewater.
- Q.6 Name any two types of sewers.
- Q.7 Give one example of primary treatment of wastewater.
- Q.8 Define air pollution.
- Q.9 List two gaseous air pollutants.
- Q.10 What is the full form of NDMA? What is its main function?

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## **PART – B**

[5×4=20]

### **(Analytical/Problem solving questions)**

#### **Attempt any five questions**

- Q.1 Compare domestic water requirements of urban and rural areas in India with suitable examples.
- Q.2 Describe the role and working mechanism of sedimentation tanks in water treatment.
- Q.3 Write a note on BIS drinking water quality standards (IS 10500 : 2012).
- Q.4 Explain the significance of hydraulic design of sewers.
- Q.5 Discuss the major physical, chemical and biological characteristics of wastewater.
- Q.6 Describe composting as a method of solid waste management.
- Q.7 Explain the concept of disaster preparedness and its importance.

## **PART – C**

[3×10=30]

### **(Descriptive/Analytical/Problem Solving/Design Questions)**

#### **Attempt any three questions**

- Q.1 Explain different sources of water supply and factors influencing the choice of a source for urban water supply schemes.
- Q.2 Explain the various stages in conventional water treatment including their functions and significance.
- Q.3 Describe in detail the methods of solid waste disposal and their suitability under Indian conditions.
- Q.4 Discuss various types of air pollutants, their sources and health/environmental impacts.
- Q.5 Explain the importance of disaster management in India and discuss different phases (prevention, preparedness, response, recovery).