INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous) Dundigal-500043, Hyderabad

B.Tech III SEMESTER END EXAMINATIONS (REGULAR/ SUPPLEMENTARY) - FEBRUARY 2024 Regulation: UG20

ANALOG AND DIGITAL ELECTRONICS

Time: 3 Hours (COMMON TO CSE | CSE(AI&ML) | CSE(CS) | CSIT | IT)

Max Marks: 70

Answer ALL questions in Module I and II Answer ONE out of two questions in Modules III, IV and V All Questions Carry Equal Marks All parts of the question must be answered in one place only

MODULE - I

- 1. (a) Demonstrate the function of diffusion capacitance with a neat sketch. Derive an expression for diode current equation. [BL: Understand| CO: 1|Marks: 7]
 - (b) In a full wave rectifier ,the transformer RMS secondary voltage from center tap to each end of the secondary is 50 V. The load resistance is 900 ohms. If the diode resistance and transformer secondary winding resistance together has a resistance of 100ohms, determine the average load current and RMS value of load current. [BL: Apply] CO: 1|Marks: 7]

MODULE - II

2. (a) Outline the operation of CB configuration and obtain an expression for current gain.

[BL: Understand] CO: 2|Marks: 7]

(b) The transistor shown in Figure 1 is the amplifier circuit which has the following h-parameters $h_{fe}=140, h_{ie}=0.86$ K $\Omega, h_{re}=1.5^{*}10^{-4}, h_{oe}=25$ \mho . Find the total input impedance and current gain by using exact hybrid model? [BL: Apply] CO: 2|Marks: 7]



Figure 1

$\mathbf{MODULE}-\mathbf{III}$

- 3. (a) State and prove De Morgan's theorem. Explain the gray to binary and binary to gray conversion with examples. [BL: Understand | CO: 3|Marks: 7]
 - (b) Implement the function $F(A,B,C,D) = \sum m(1,5,6,9,11,12,13)$ using NAND-NAND logic.

[BL: Apply] CO: 3|Marks: 7]

- 4. (a) List out the basic logic gates with truth tables. Differentiate between BCD code, 2421 code and excess-3 code. [BL: Understand] CO: 4|Marks: 7]
 - (b) Simplify the following function into canonical POS, Z=(A+C+D)(B+C).

[BL: Apply] CO: 4|Marks: 7]

$\mathbf{MODULE}-\mathbf{IV}$

- 5. (a) How do you convert a decoder into a demultiplexer? Explain 4-bit carry look-ahead adder with necessary diagram and relevant expressions. [BL: Understand| CO: 5|Marks: 7]
 - (b) Obtain the simplified Boolean expression using K-map $F(W,X,Y,Z) = \sum m(1,5,6,8,9,10) + \sum d(2,4)$. [BL: Apply] CO: 5|Marks: 7].
- 6. (a) Implement the full subtractor circuit using half subtractor and justify with boolean expressions. [BL: Understand] CO: 5|Marks: 7]

(b) Realize a hazard free circuit for the following minterm $F(A,B,C,D) = \sum m(0,4,5,7,8,11,12,13,15)$. [BL: Apply] CO: 5|Marks: 7]

$\mathbf{MODULE}-\mathbf{V}$

7. (a) Outline the operation of Johnson counter and Ring counter with neat sketch.

[BL: Understand] CO: 6|Marks: 7]

(b) Design a counter circuit to count 1, 5, 9, 12, 13, 15, 1, 5, 9, 12, 13 using SR flip flop.

[BL: Apply] CO: 6|Marks: 7]

- 8. (a) Illustrate a JK flip-flop using NAND-NAND logic and obtain its characteristic expression and excitation table. [BL: Understand] CO: 6|Marks: 7]
 - (b) Differentiate between combinational and sequential circuits. Design a 4 bit bidirectional shift registers using D flip-flop. [BL: Apply] CO: 6|Marks: 7]

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