Hall Ticket No | | | | | | | | | | | Question Paper Code: AECB05

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER-I

B.Tech III Semester End Examinations, November 2020

Regulations: IARE - R18

ANALOG AND DIGITAL ELECTRONICS

INFORMATION TECHNOLOGY

Time: 3 hour Maximum Marks: 70

Answer ONE Question from each MODULE
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

MODULE-I

1. (a) Find the value of D.C. resistance and A.C resistance of a Germanium junction diode at 250^0C with reverse saturation current, $I_0 = 25\,\mu A$ and at an applied voltage of 0.2V across the diode? [**7m**]

   (b) Explain about characteristics of PN Diode and Derive the expression for diode equation with neat sketches. [**7m**]

2. (a) Construct the circuit diagrams of a full wave rectifier and Bridge rectifier. Explain the operation of the circuit with relevant waveforms. [**7m**]

   (b) Explain the applications of p-n junction diode and explain how the p-n diode acts as a switch. [**7m**]

MODULE-II

3. (a) Identify the various current components in an NPN bipolar junction transistor With a neat diagram. [**7m**]

   (b) A common collector circuit has the following components $R_1 = 27k\Omega, R_2 = 27k\Omega,\ R_e = 5.6k\Omega, R_L = 47k\Omega, R_s = 600k\Omega$. The transistor parameters are $h_{ie} = 1k\Omega,\ h_{fe} = 85$ and $h_{oe} = 2\mu A/V$. Determine A_i, R_i, A_v, R_0. [**7m**]

4. (a) Explain the DC and AC load line analysis of a BJT. [**7m**]

   (b) Draw small signal equivalent circuit of Emitter Follower using accurate hparameter model. For the emitter follower circuit with $R_s = 0.5K$ and $R_L = 5K$, calculate R_i, A_v, R_0. Assume, $h_{fe} = 50$, $h_{ie} = 1K$, $h_{0e} = 25\mu A/V$. [**7m**]

MODULE-III

5. (a) Add the following binary numbers. [**7m**]

   (i) 11011+1101

   (ii) 10111.101 + 110111.01

(iii) 1010.11 + 1101.10

(b) Convert the following numbers from the given base to the other bases indicated. [**7m**]

(i) Decimal 225 to binary, octal

(ii) Octal 623 to decimal, binary

6. (a) Given the 8bit data word 01011011, generate the 12 bit composite word for the hamming code that corrects and detects single errors. [**7m**]

(b) Obtain the canonical SOP form of the following functions. [**7m**]

(i) Y(A,B) = A+B.

(ii) Y(A,B,C,D) = AB+ACD

MODULE-IV

7. (a) Implement full subtractor using NAND gates. [**7m**]

(b) Simplify the following Boolean function using, four-variable K-map
$F(A, B, C, D) = \sum m(0, 2, 4, 5, 6, 7, 8, 10, 13, 15)$ [**7m**]

8. (a) Develop a combinational circuit that adds 4-bit number. The circuit can be designed using four full-adders. [**7m**]

(b) Simplify the following using Tabular method.
$F(A, B, C, D) = \sum(1, 5, 6, 12, 13, 14) + d\sum(2, 4)$ [**7m**]

MODULE-V

9. (a) Explain JK Flip-flop with the help of a logic diagram and characteristic table? [**7m**]

(b) Implement the Ripple counter design. Also the decade counters design? [**7m**]

10. (a) Demonstrate Latch. Explain about Different types of Latches in detail? [**7m**]

(b) Construct a MOD-5 synchronous counter using flip flops and timing diagram of synchronous counter. [**7m**]

****END OF EXAMINATION****

COURSE OBJECTIVES:

The course should enable the students to:

1	The Fundamental knowledge of the operational principles and characteristics of semiconductor devices and their applications.
2	The basic concept of number systems, boolean algebra and optimized implementation of combinational and sequential circuits.
3	The perceive subsequent studies in the area of microprocessors, microcontrollers, VLSI design and embedded systems effectively use of fundamentals of digital electronics.

COURSE OUTCOMES:

After successful completion of the course, students should be able to:

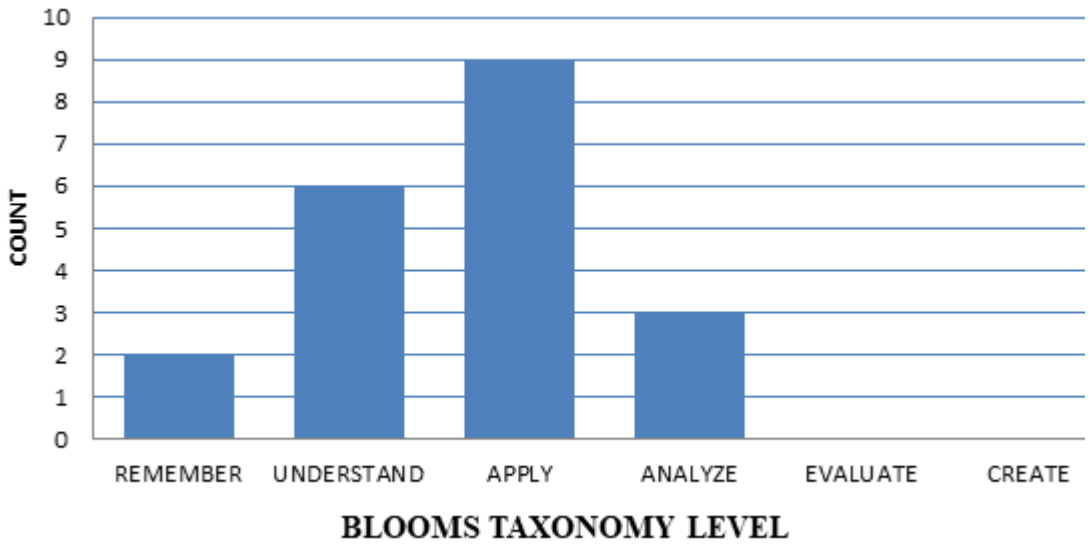
CO 1	Recall the properties of semiconductor materials which form the basis for the formation of PN junction diode.
CO 2	Illustrate the volt-ampere characteristics of semiconductor devices for finding cut-in voltage, static, dynamic resistance and transition, diffusion capacitance.
CO 3	Apply the pn junction characteristics for the diode.Applications such as switch and rectifiers.
CO 4	Explain half wave and full wave rectifier circuits with filter and without filters for conversion of alternating current in to direct current.
CO 5	Interpret DC and AC load line analysis of different amplifiers for optimal operating level regardless of input, load placed on the device.
CO 6	Analyse the input and output characteristics of transistor configurations and small signal h-parameter models for determining the input - output resistances, current gain and voltage gain.
CO 7	Compare the binary decimal, octal and hexadecimal number systems in terms of basic arithmetic operations.
CO 8	Identify the functionality of logic gates, parity code and hamming code techniques for error detection and correction of single bit in digital systems.
CO 9	Apply Boolean postulates and theorems, k-map and tabular methods for obtaining minimized Boolean expressions.
CO 10	Develop gate level combinational circuits to built adders, subtractors, multiplexers, demultiplexers, encoder and decoders.
CO 11	Describe the operation of Flip-Flops and latches for constructing sequential circuits .
CO 12	Implement the synchronous& asynchronous counters for memory storing applications.

MAPPING OF SEMESTER END EXAMINATION QUESTIONS TO COURSE OUTCOMES

Q.No		All Questions carry equal marks	Taxonomy	CO's	PO's
1	a	Find the value of D.C. resistance and A.C resistance of a Germanium junction diode at 250^0C with reverse saturation current, $I_0 = 25\,\mu\,A$ and at an applied voltage of 0.2V across the diode?	Understand	CO 2	PO 1,2
	b	Explain about characteristics of PN Diode and Derive the expression for diode equation with neat sketches.	Remember	CO 1	PO 1
2	a	Construct the circuit diagrams of a full wave rectifier and Bridge rectifier. Explain the operation of the circuit with relevant waveforms.	Understand	CO 2	PO 1,2
	b	Explain the applications of p-n junction diode and explain how the p-n diode acts as a switch.	Remember	CO 1	PO 1
3	a	Identify the various current components in an NPN bipolar junction transistor With a neat diagram.	Apply	CO 3	PO 1
	b	A common collector circuit has the following components $R_1 = 27k\Omega, R_2 = 27k\Omega$, $R_e = 5.6k\Omega, R_L = 47k\Omega, R_s = 600k\Omega$. The transistor parameters are $h_{ie} = 1k\Omega$, $h_{fe} = 85$ and $h_{oe} = 2\mu A/V$. Determine A_i, R_i, A_v, R_0.	Understand	CO 4	PO 1,2
4	a	Explain the DC and AC load line analysis of a BJT.	Understand	CO 5	PO 1,2
	b	Draw small signal equivalent circuit of Emitter Follower using accurate hparameter model. For the emitter follower circuit with $R_s = 0.5K$ and $R_L = 5K$, calculate R_i, A_v, R_0. Assume, $h_{fe} = 50$, $h_{ie} = 1K$, $h_{0e} = 25\mu A/V$.	Analyze	CO 6	PO 1,2
5	a	Add the following binary numbers.(i) 11011+1101 (ii) 10111.101 + 110111.01 (iii) 1010.11 + 1101.10	Analyze	CO 7	PO 1
	b	Convert the following numbers from the given base to the other bases indicated. (i) Decimal 225 to binary, octal (ii) Octal 623 to decimal, binary	Analyze	CO 7	PO 1
6	a	Given the 8bit data word 01011011, generate the 12 bit composite word for the hamming code that corrects and detects single errors.	Apply	CO 9	PO 1,2

	b	Obtain the canonical SOP form of the following functions. (i) Y(A,B) = A+B. (ii) Y(A,B,C,D) = AB+ACD	Apply	CO 8	PO 1,2
7	a	Implement full subtractor using NAND gates.	Apply	CO 10	PO 1,2
	b	Simplify the following Boolean function using, four-variable K-map $F(A,B,C,D) = \sum m(0,2,4,5,6,7,8,10,13,15)$	Apply	CO 9	PO 1,2
8	a	Develop a combinational circuit that adds 4-bit number. The circuit can be designed using four full-adders.	Apply	CO 10	PO 1,2
	b	Simplify the following using Tabular method. $F(A,B,C,D) = \sum(1,5,6,12,13,14) + d\sum(2,4)$	Apply	CO 9	PO 1,2
9	a	Explain JK Flip-flop with the help of a logic diagram and characteristic table?	Understand	CO 11	PO 1,2
	b	Implement the Ripple counter design. Also the decade counters design?	Apply	CO 12	PO 2
10	a	Demonstrate Latch. Explain about Different types of Latches in detail?	Understand	CO 11	PO 1,2
	b	Construct a MOD-5 synchronous counter using flip flops and timing diagram of synchronous counter.	Apply	CO 12	PO 2

KNOWLEDGE COMPETENCY LEVELS OF MODEL QUESTION PAPER



Signature of Course Coordinator **HOD,IT**