Name:

Enrolment No:

UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, May 2019

Programme Name: B.Tech- ECE, Electrical ADE, Mechatronics, ASE, ASE+AVE, GSE, GIE, FSE & Civil **Semester : II**

Course Name : Basic Electronics Engineering **Time : 03 hrs**

Course Code : ECEG1002 **Max. Marks : 100**

Nos. of page(s) : 4

Instructions: Attempt all the questions

SECTION A

S. No.		Marks	CO
Q 1	Define the following terms with respect to a PN junction. 1. Knee Voltage 2. Break down voltage 3. Forward Current 4. Reverse Current 5. PIV	**5**	**CO1**
Q 2	A BJT has four modes for operation depending on polarities of emitter base junction and collector base junction Specify the Junction Bias for the below specified modes and represent the same in the Output characteristics.	**5**	**CO1**

Mode	B – E Junction (FB -Forward Bias and RB-Reverse Bias)	B – C junction (FB -Forward Bias and RB-Reverse Bias)
Active		
Saturation		
Cutoff		

Q 3	(A) Calculate the voltage across the diode V_{out} if Vin is -5V and resistance is 10KΩ(Figure 1) .	**5**	**CO2**

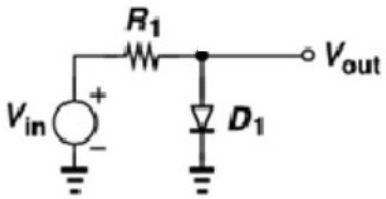


Fig: 1

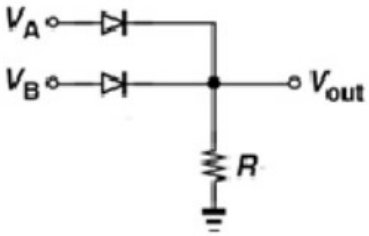
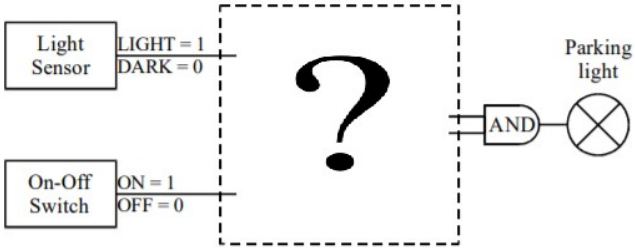
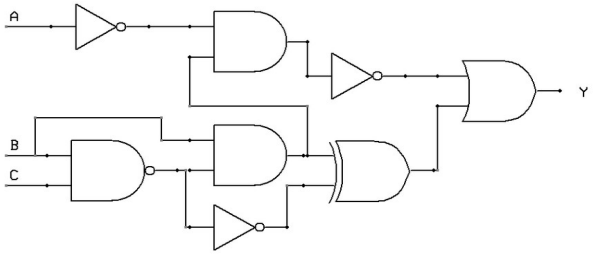
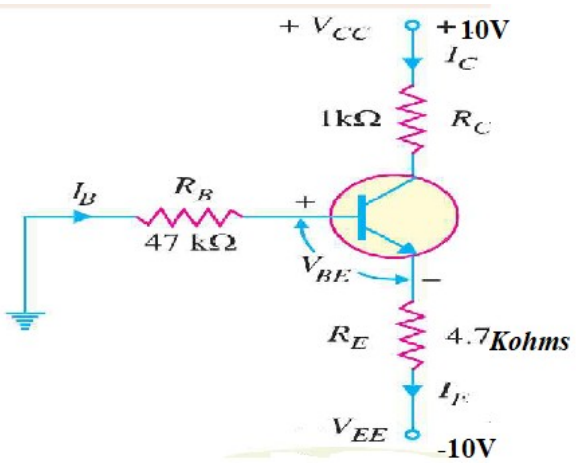
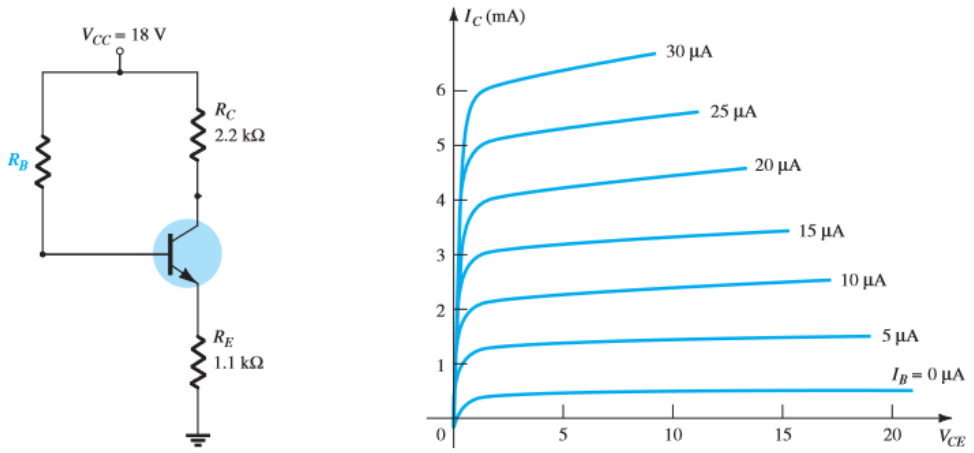


Fig: 2

(B) Calculate what will be the voltage V_{out} if V_A = 3V and V_B = -5V in Figure.2?

Q 4	(A) If a 3-input NOR gate has eight input possibilities, how many of those possibilities will result in a HIGH output? (B) A car may be fitted with an automatic parking light which switches on when the car is parked at night. The diagram shows an incomplete system for a parking light.  Fig:3 Complete the diagram with an appropriate gate to make the parking light work.	**5**	**CO2**
	SECTION B		
Q 5	Using only NAND gates, construct a circuit that will implement the following logical expressions. Use Boolean algebra to simplify the expressions as much as possible before you begin. 1. $(A \cdot B) + (A \cdot B) + (A \cdot B) + (A \cdot B)$ 2. $[(A \cdot B) + C] \cdot [(A \cdot B) + D]$ 3. $[(A \cdot B) \cdot (A \cdot B)] + (A \cdot B)$ 4. $(1 + B) \cdot (A \cdot B \cdot C)$	**10**	**CO2**
Q 6	A. In CE configuration Vcc=10 V, R_L=8 x 10^3 ohm. Draw the circuit diagram, load line and determine operating point for zero signal if base current is 12 μA and β=40. B. Develop the simplified Boolean expression for the following digital circuit shown in figure below:  *Fig:4*	**10**	**CO2**
Q 7	Present the Comparative study of CB, CE and CC configuration with their relative parameters and conclude with the most commonly used transistor configuration. Draw the configuration diagrams and mention the applications.	**10**	**CO3**

	OR For a transistor derive the expression for α andβ. In a transistor configuration, $I_B = 18\mu A$, $I_E = 25mA$, and $\alpha = 0.096$. Determine the β rating the transistor. Also calculate the collector current.		
Q 8	Explain the functioning of a Zener diode as voltage regulator for both variable input as well as variable load arrangements draw the circuits and derive the important expressions.	**10**	**CO2**
	SECTION-C (Internal Choice in Q.9 and Q.10)		
Q 9	Determine the *Q* point of the transistor circuit shown below. Draw the dc load line, given β=100 and V_{BE} = 0.7 V.  Fig:5	**20**	**CO1& CO2**
Q10	(A)Draw the load line for the network of Fig. below on the characteristics for the transistor appearing in Fig. (B) For a Q -point at the intersection of the load line with a base current of 15 m A, find the values of I_{CQ} and V_{CEQ}. (C) Determine the dc beta at the Q -point. (D) Using the beta for the network determined in part C, calculate the required value of R_B and suggest a possible standard value.	**20**	**CO1& CO2**

	 Fig:6		
Q11	(A) Perform the following number system conversions: 1. $101101112 = (\ )_{10}$ 2. $567410 = (\ )_{2}$ 3. $100111002 = (\ )_{8}$ 4. $24538 = (\ )_{2}$ 5. $1111000102 = (\ )_{16}$ (B) Using Boolean laws prove the following. 1. $(\overline{AC}+B)(\overline{\overline{A}+\overline{C}})=ABC$ 2. $(A+B+C)(A+\overline{B}+C)(A+B+\overline{C})(A+\overline{B}+\overline{C})=A$ 3. $ABC+A\,\overline{B}\,C+AB\,\overline{C}=A(B+C)$ 4. $A(B+\overline{C})+B(C+\overline{A})+C(A+\overline{B})=A+B+C$ 5. $AB+\overline{A}\,C+BC=AB+\overline{A}\,C$	**20**	**CO3**

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Course Code : ECEG1002 **Max. Marks : 100**

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Instructions: Attempt all the questions

SECTION A

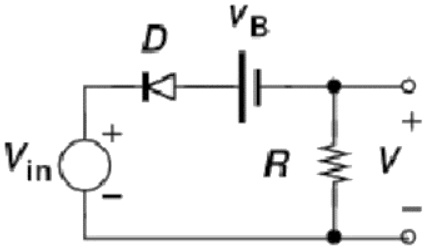
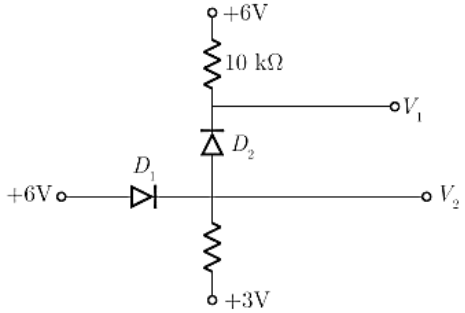
S. No.		Marks	CO
Q 1	Explain the following terms relating to PN junction. 1. Maximum Power rating 2. Static and dynamic forward resistances 3. Reverse Resistances 4. Barrier potential 5. Maximum Forward Current	**5**	**CO1**
Q 2	Present the operation of transistor as a switch. And draw the necessary characteristics.	**5**	**CO1**
Q 3	(A) In the circuit below V_B= 2V, V_{in}= 5V. calculate the voltage across resistor R i  Fig:1 (B) Calculate the voltage at V1 and V2 of the arrangement shown in Fig. will be respectively. (Assume diode cut in voltage = 0.6 V)  	**5**	**CO2**

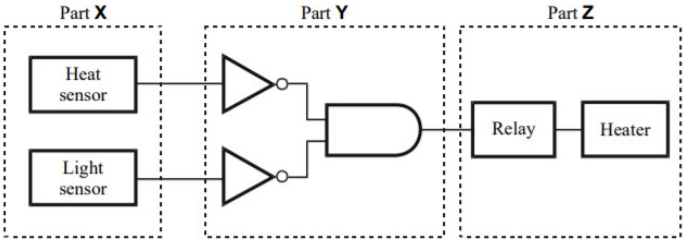
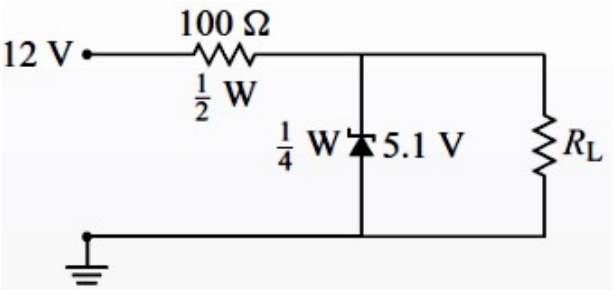
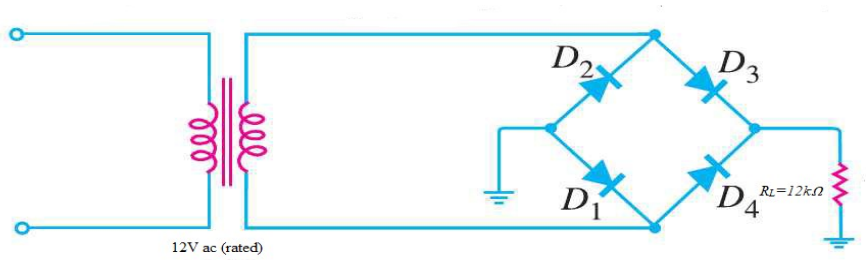
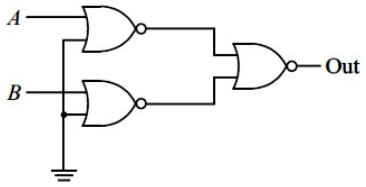
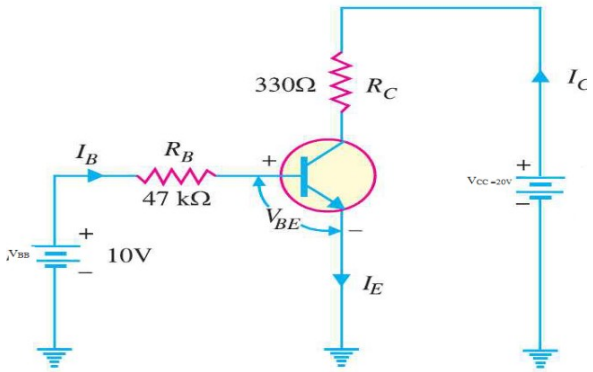
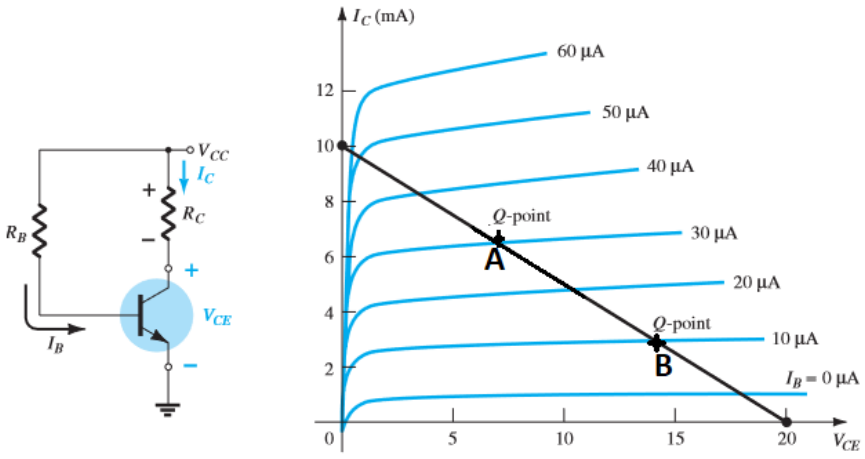
	Fig:2		
Q 4	The diagram below is a block diagram of an electronic circuit. The parts of the circuit are labelled X, Y and Z.  Fig:3 (A) Name the two types of logic gate used in the circuit above. (B) Give an electrical device which could be used as: (i) the heat sensor (ii) the light sensor. (C) Which part of the circuit, X, Y or Z, is: i)the processor? ii) the input device(s)? iii)the output device(s)? (D) The heat sensor is ON when it is hot and OFF when it is cold. The light sensor is ON when it is light and OFF when it is dark. (i) Explain what happens in each part of the circuit when it is both cold and dark.	**5**	**CO2**
	SECTION B		
Q 5	In the circuit of Fig. below, what would happen if the load resistor were shorted? (b) What would happen if the load resistor were removed? Support your answers with calculations. Hint: think in terms of power ratings.  Fig:4	**10**	**CO2**
Q 6	The bridge rectifier shown in figure below uses silicon diodes. Find dc output voltage and dc output current. Use simplified diode model. (Vin=12V,50Hz ,R_L=12KΩ)  	**10**	**CO3**

	Fig:5		
Q 7	(A) Using only NOR gates, give circuits that are equivalent to each of the following: AND, OR, NAND, and XOR. (B) Develop the truth table for the circuit shown in Fig. . below.  Fig:6	**10**	**CO2**
Q 8	Convert the following numbers into corresponding number system. (2.5 marks each) 1. $6893410 = (\ )_2$ 2. $10101.0012 = (\ )_{10}$ 3. $6FAB716 = (\ )_{10}$ 4. $11101.1012 = (\ )_8$ 5. $5623816 = (\ )_2$	**10**	**CO3**
	SECTION-C(Internal Choice between Q9 and Q10)		
Q 9	(A) Determine the *Q* point of the transistor circuit shown below. Draw the dc load line, given β=200 and $V_{BE} = 0.7$ V  Fig:7	**20**	**CO1& CO2**
Q10	A) Given the load line of Fig below and the defined Q- point(A), determine the required values of V_{CC} , R_C , and R_B and	**20**	**CO1& CO2**

	 Fig:8 B)Draw the variation of the Q-point for the following cases: 1)with increasing level of I_B 2) Effect of an increasing level of R_C on the load line and the Q-point. 3) Effect of lower values of V_{CC} on the load line and the Q-point.		
Q11	(A) Develop a full adder using two half adders. Support your circuit with the help of a truth table. (B) Simplify the following Boolean expressions: 1. $Y = 1 + A(B.\acute{C} + BC + \acute{B}.\acute{C}) + A\acute{B}C + A$ 2. $Y = (A + \acute{B} + \acute{C}) + (B + \acute{C})$ 3. $Y = (A + B + C).(A + B)$ 4. $Y = AB + ABC + AB\acute{C}$	**20**	**CO3**