Bachelor of Engineering in Production Engineering
First Year – Second Semester Examinations 2018
Subject: **Basic Electronics Engineering**

Time : **Three hours**   **Full Marks: 100**

ANSWER ALL THE FIVE MODULES
All parts of the same question must be answered at one place only.

Mod ule 1 [20 Marks]	Answer any two(2) from (a), (b) and (c) in this Module 1: 1. (a) i. Forbidden energy gap for silicon is_____. ii. Semiconductors have_____temperature coefficient of resistance. iii. The conductivity of an intrinsic semiconductor_____with temperature. iv. The mobility of charge carriers has the unit_____. v. Why intrinsic semiconductors behave like an insulator at low temperatures? vi. Define diffusion current and drift velocity in a semiconductor.　　　[1+1+1+1+3+3] (b) i. An ideal diode offers_____resistance when forward biased and_____resistance when it is reverse biased. ii. Draw and explain the VI characteristics of a PN junction diode. Write the volt-ampere equation for a PN diode (explain meaning of each symbol) iii. Explain the input and output characteristics of a transistor in CE configuration.　　　[2+4+4] (c) i. Compare insulators, semiconductors and conductors on the basis of energy band diagram. ii. Name the elements which are used as N-type impurities and P-type impurities. iii. What do you mean by transition capacitance in PN-junction? iv. What is meant by the term "Barrier potential"? What is the value for Germanium diode?　[3+2+3+2]
Mod ule 2 [20]	Answer any **two(2)** from **(a), (b)** and **(c)** in this Module 2: 2. (a) i. Draw the circuit diagram of half-wave rectifier (HWR) and explain its operation. ii. Discuss the working of full-wave rectifier (FWR) circuit with shunt capacitor filter. Draw the output voltage waveform. iii. What is a clipper circuit?　　　[4+4+2] (b) i. The three terminals of bipolar junction transistor are called_____,_____and_____. ii. Derive the relation between α and β. iii. Draw a fixed bias circuit and obtain the value of d.c. voltage and current in the circuit.　　　[3+3+4] (c) i. State whether the statement is true or false: 　　i.i Germanium is a conductor. 　　i.ii In P-type semiconductor, the majority carriers are hole. 　　i.iii A full-wave rectifier utilizes only positive half cycle. 　　i.iv For a half-wave rectifier : $PIV = 2V_m$. 　　i.v A transistor can be treated as a two port network. ii. Distinguish between zener breakdown and avalanche breakdown. iii. Define ripple factor.　　　[1+1+1+1+1+3+2]
Mod ule 3 [10]	*Answer any* **one(1)** *from* **(a)** *and* **(b)** *in this Module 3:* 3. (a) i. What is an oscillator? ii. what do you mean by monostable multivibrator? iii. Explain with circuit diagram, the operation of astable multivibrator using transistor.　　　[2+3+5] **(OR)** (b) i. Compare class A, class B and class C amplifier. ii. Explain push-pull amplifier with circuit diagram.　　　[5+5]

Mod ule 4 [40]	*Answer any* **two(2)** from **(a)**, **(b)** and **(c)** *in this Module 4:*
	
	 4. (a) i. Convert the following numbers:
	     i.i. $(10101.0101)_2 \equiv (?)_{10}$
	     i.ii. $(16.73)_{10} \equiv (?)_2$
	     i.iii. $(2BF.9B)_{16} \equiv (?)_2$
	     i.iv. $(1745)_8 \equiv (?)_{16}$
	    ii. Obtain 2's complement of $(10111010)_2$ and $(10011011)_2$.
	    iii. Add (i) $(110101)_2$ and $(100100)_2$ (ii) $(10111010)_2$ and $(101001)_2$
	    iii. Subtract (i) $(01111)_2$ from $(10101)_2$ (ii) $(1010)_2$ from $(1100)_2$ **[8+4+4+4]**
	
	   (b) i. State De-Morgan's theorem. Show its logic implementation.
	
	    ii. Simplify the following Boolean expression:
	
	     ii.i. $Y = \overline{AB} + A + \overline{B + C}$
	
	     ii.ii. $Y = AB + \overline{AC} + A\overline{B}C(AB + C)$
	
	     ii.iii $Y = (A + B + C)(A + \overline{B} + C)(A + B + \overline{C})$
	
	    iii. Add (i) $(57)_{10}$ and $(27)_{10}$ (ii) $(83)_{10}$ and $(34)_{10}$ using BCD numbers.
	
	    iv. Convert (i) $(1011)_2$ to gray code (ii) $(1110)_2$ gray code to binary code. **[6+6+4+4]**
	
	   (c) i. Obtain the implementation of given function $Y = AB + AC + C\overline{B}$ and $Y = (X + Y)\overline{(X + Z)}(\overline{Y} + \overline{Z})$ using logic gates.
	
	    ii. Draw the symbols of universal gates. Write their truth table (with 2-inputs).
	
	    iii. Realize half adder (HA) circuit and explain with truth table.
	
	    iv. Realize AND, OR and NOT using only NAND gates. **[6+4+4+6]**

Mod ule 5 [10]	*Answer any* **one(1)** from **(a)** and **(b)** *from this Module 5:*
	
	 5. (a) i. Distinguish between combinational circuit and sequential circuits.
	    ii. What is a flip-flop?
	    iii. Describe the working of SR flip-flop with circuit diagram and truth table. **[3+3+4]**
	  (OR)
	   (b) i. What is the difference between latch and flip-flop?
	    ii. What is a clock signal? What is the purpose of the clock signal?
	    iii. Draw the circuit diagram of JK flip-flop.
	    iv. What is race around condition in JK flip-flop? **[2+3+2+3]**