EX./EE/ET/T/122/2018

B. E. ELE. ENGG. 1ST YEAR 2ND SEMESTER EXAM, 2018

ELECTRONICS – I **Time: Three hours** **Full Marks: 100**

Use a separate Answer-Script for each Part (50 marks for each Part)

PART-I

Answer ***Q.1*** and any ***two*** questions from the rest [10+2×20=50]

1. Answer any ***five*** from the following : [5×2=10]
   a) Define Intrinsic and Extrinsic semiconductors with example.
   b) Draw the Energy band diagram of p-n junction diode.
   c) Define ripple factor of a rectifier.
   d) What is the Peak Inverse Voltage (PIV) of a half wave rectifier?
   e) Draw common collector mode BJT.
   f) What is the efficiency of class -A power amplifier. How can it be increased?
   g) What are the types of MOSFET? Draw the circuit symbols.

2. a) Determine the position of the intrinsic Fermi level and show in the energy band diagram. [6]

   b) A Silicon wafer is doped with 10^{16} Arsenic atoms/cc at 350 K. Calculate
      i) carrier concentrations
      ii) the position of the Fermi level in the energy band diagram.
      iii) electron mobility if resistivity is 0.5 Ω-cm.
      iv) and diffusivity

   Given that $n_i=1.5\times10^{10}$/cc and $E_g=1.14$ eV at T= 300 K. Assume Density of states are constant. E_g =1.1 eV at T=350K. Boltzmann constant, $k=1.38\times10^{-23}$ J/K . [4+5+2+3]

[Turn over

3. a) Draw and explain positive and negative clippers using p-n junction diode. [8]

   b) Draw and explain Input and output characteristics of npn CE mode BJT. [12]

4. a) Define three stability factors associated with biasing. Draw the circuit for fixed bias and collector feedback bias. Qualitatively compare the stability of the two biasing circuits. [3+2+5]

   b) For the Zener voltage regulator circuit with Zener voltage V_Z=15 V, Zener impedance Z_Z =2Ω @ test current I_{ZT}= 49 mA, knee current I_{ZK}= 1 mA, maximum power dissipation P_D(max)=1 W, and series resistance R= 100 Ω. Determine the minimum and maximum input voltage that can be regulated by the Zener diode. Assume that the Zener impedance is constant over the normal region of operation. For maximum input voltage determine the range of load, R_L can be connected. [10]

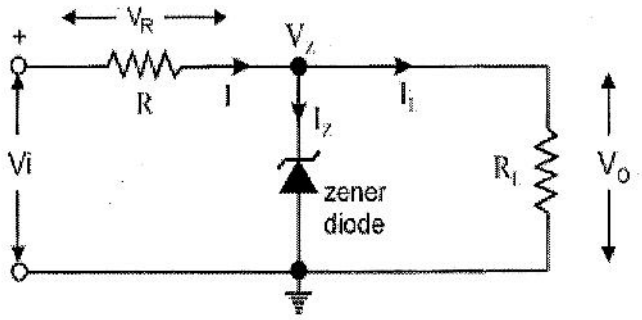

Figure 1

5. a) With the help of hybrid parameter equivalent circuit determine the voltage gain, current gain, input impedance and output impedance of the basic CE mode transistor amplifier.[12]

   b) Explain pinch-off phenomena associated with n- channel JFET. [8]

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(1st year, 2nd Semester)

Subject: Electronics-I **Time: 1.30 Hours** **Full Marks: 50**

Use separate answer script

No. of questions	**PART- II** Answer **question no. 6** and any **two from the rest**	Marks
6.	Answer ***any five*** questions: a. Distinguish between positive and negative feedback. b. How the ***noise*** of an amplifier is more reduced for the application of negative feedback? c. Mention the ideal and practical characteristics of an Operational amplifier? d. Distinguish between inverting and non-inverting Operational amplifier. e. Why direct band gap semiconductors are used to fabricate LED? f. How noise is cancel out for a differential amplifier? g. What is the significance of common mode rejection ration of an amplifier? h. How an operational buffer amplifier is designed?	5x2=10
7.	a) How is the gain and bandwidth of an RC coupled amplifier modified due to the application of negative feedback? b) Make a comparative study for the effect of four topologies of negative feedback on input and output impedance of an amplifier. c) Draw a circuit for a voltage series feedback using BJT and explain how this topology of feedback is occurred in this circuit? Determine the expression for the gain with feedback of this circuit.	(3+3)+4+(3+3+4)
8.	a) Draw an OPAMP precision rectifier circuit and explain its operation. b) Why an OPAMP comparator circuit is required? b) Design an OPAMP circuit to generate the output voltage is proportional to the algebraic sum of the input voltages. c) Design an OPAMP circuit to generate the Sine wave at its output. d) For an OPAMP differential circuit has the following parameters. $R_1 = R_2 = 1.0$ KΩ and $R_F = R_3 = 10.0$ KΩ (the symbol have their usual meaning). Calculate the gain and input resistance of this circuit.	(2+3)+2+(3+3)+3+4
9.	a) Describe how an OPAMP differentiator circuit produces a very narrow spike waveform at its output due to the application of square waveform at its input? b) Mention the basic difference between the ***sawtooth*** and ***triangular*** waveform. Design a ***Triangular*** waveform generator using OPAMPs and necessary circuitry. Explain how this circuit generates the triangular waveform? c) Write short notes (any ***one***) of the following: i) Opto-Isolator iii) LDR iv) Photo-transistor	4+(2+5+4)+(5 x 1)

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10.	a) Write down the working principle of a ***Light Emitting Diode (LED)*** with suitable energy band diagram. b) How ***Bird*** can be display using 7-Segment display? c) Sketch the output current-voltage characteristics of a **photo-diode** and explain the nature of this curve. d) Write down the working principle of **Liquid Crystal Display (LCD)**.	5+5+6+4