Paper Code: EC-201/EC-101	**Roll No.**									

B. TECH.
(SEM II) EVEN SEMESTER EXAMINATION, 2015-16
ELECTRONICS ENGINEERING

[Time: 3 hrs.] **[Max. Marks: 100]**

Note: - Attempt all questions. All questions carry equal marks.

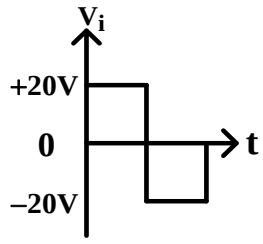
1. Attempt any four parts of the following: - **[5x4=20]**

(a) Describe the difference between *n*-type and *p*-type semiconductor materials. Also give energy band diagram.

(b) Determine the diode current at 27°C for a silicon diode with *Is* 30 nA and an applied forward bias of 0.7 V.

(c) Describe in your own words how diffusion and transition capacitances differ.

(d) Determine V_0 for the following circuit shown in Fig. 1. Also name the configuration.



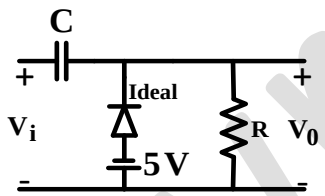


Fig. 1

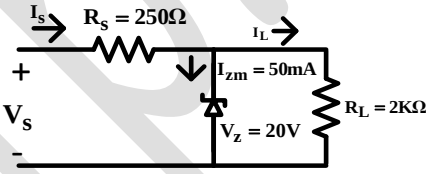
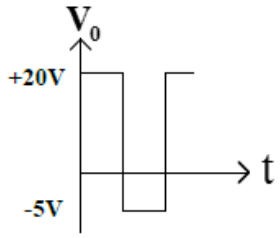


Fig. 2

(e) Determine the range of values of V_S for the zener diode to remain in 'ON' state. Given for zener diode V_Z=20V, I_{Zmax}=50mA, R_Z=0, shown in Fig. 2

(f) Determine *Vo* for each network of Fig.3 (a) and Fig.3 (b) for the given input shown.



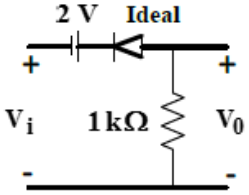


Fig.3 (a)

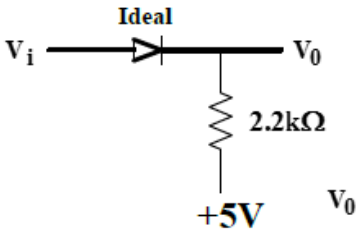
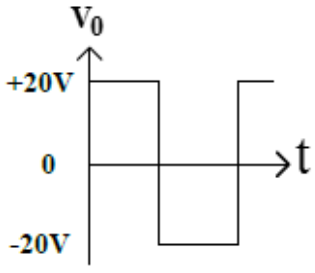
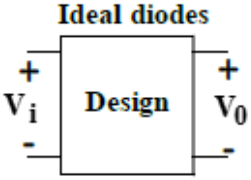


Fig.3 (b)

2. Attempt any four parts of the following: - **[5x4=20]**

(a) Design a clamper to perform the function indicated in Fig. 4.





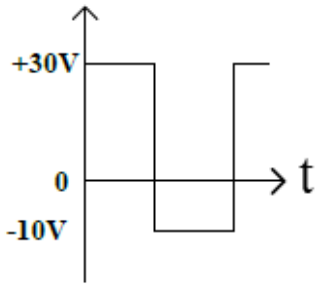


Fig. 4

(b) Design a voltage regulator that will maintain an output voltage of 25 V across a 1kΩload with an input that will vary between 30 and 50 V. That is, determine the proper value of *Rs* and the maximum current I_{ZM}.

(c) What is the major difference between a bipolar and a unipolar device?

(d) For the voltage divider bias circuit, determine I_{BQ}, I_{CQ}, V_{CEQ}, V_C, V_E, V_B and $I_{C\,sat}$ shown in Fig .5.

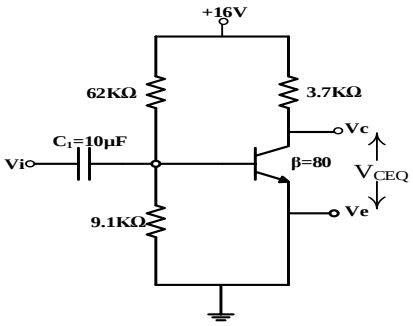


Fig.5

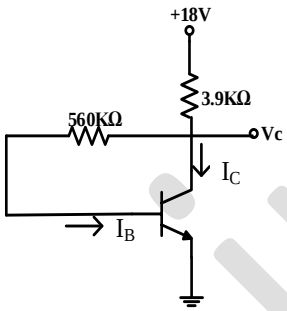


Fig. 6

(e) Given V_c = 8V, determine I_B, I_C, β and $V_{CE,}$ for the circuit shown in Fig.6.

(f) Determine R_C and R_B for a fixed-bias configuration if V_{CC} =12 V, β = 80, and I_{CQ} =3.0 mA with V_{CEQ} =6 V. Use standard values.

3. Attempt any two parts of the following: - **[10x2=20]**

(a) Draw the construction of a JFET and explain its principle of operation with neat diagram. Also sketch its V-I characteristics. Define pinch-off voltage and show on characteristics.

(b) Describe briefly, the construction of a MOSFET in Enhancement mode. Draw its characteristics. Also define the Shockley's equation, and derive the expression for g_m.

(c) Determine the resistance offered by a FET whose drain current changes by 7mA for a change of 5V in gate-source voltage, given its amplification factor is 10.

4. Attempt any two parts of the following: - **[10x2=20]**

(a) What are the properties of an ideal operational amplifier? Define and explain the term common mode rejection ratio (CMRR) and virtual ground in op-amp.

(b) Explain with the help of circuit diagrams how it is used as

(i) Subtractor (ii) Differentiator

(c) Sketch a three input inverting summing circuit and derive an expression for the output voltage. Design a Non-Inverting amplifier capable of providing a voltage gain of 15. Assume ideal Op-Amp and Resistances used should not be exceeding 30KΩ.

5. Attempt any two parts of the following: - **[10x2=20]**

(a) How the construction of the hot-carrier diode is significantly different from the conventional semiconductor diode. Also describe its mode of operations and compare its characteristic a p-n junction diode.

(b) Draw the construction and explain the characteristics of the following devices:

(i) Photodiode (ii) Tunnel diode

(c) Draw the construction and explain the characteristics of the following devices:

(i) SCR (ii) TRIAC