

Bengal Engineering and Science University, Shibpur
B.E. 2nd Semester (ETC, CST, IT, EE) Final Examination, 2013
Subject: Basic Electronics
Code: ET 1201

Time: 3 hours.

Full Marks: 70

(Answer any five questions)

1. (a) Discuss the way to differentiate between Zener and Avalanche breakdown mechanisms.
(b) Draw the circuit diagram and explain the operation of a clamper circuit.
(c) Find expressions for the average output voltage of a half-wave rectifier and compare it with that of a full-wave rectifier. [4+4+6=14]

2. (a) Draw the voltage divider biasing circuit of an n-p-n BJT. Show that the voltage divider part of the circuit can be replaced by a voltage source in series with a resistance where,

$$V_B = \frac{R_2}{R_1 + R_2} V_{CC} \quad \text{and} \quad R_B = \frac{R_1 \cdot R_2}{R_1 + R_2}$$

- (b) What are the advantages of emitter self bias over constant base current bias and collector to base bias scheme? Discuss the role of 'emitter bypass capacitor' in emitter self bias scheme? [6+4+4=14]

3. (a) What is feedback amplifier? Derive an expression for the closed loop gain of the amplifier with feedback. State the assumptions made in your derivation. What is bandwidth?

- (b) A negative feedback of $\beta=0.002$ is applied to an amplifier of gain=1000. Calculate the percentage change in overall gain of feedback amplifier if the internal amplifier is subjected to a gain reduction of 15%. [8+6=14]

4. (a) With the help of band diagram explain intrinsic, P-type and N-type semiconductors?

(b) What are the consequences of 'Early effect'?

- (c) Why is the width of base region of a BJT kept thinner and most lightly doped compared to other regions? [5+4+5=14]

5. (a) Draw and explain the $V_{DS} - I_D$ characteristics of N-channel JFET.

- (b) Discuss the relative advantage and disadvantage of BJT and JFET. [9+5=14]

6. (a) What are the properties of an ideal op-amp? Discuss the operation of differentiator circuit using OPAMP.

(b) Discuss the operation of inverting and non-inverting amplifier. Which one is mostly used and why?

- (c) What is 'Virtual ground'? [5+7+2=14]

7. (a) Give the Truth Table of AND-gate and realize it using all NOR gates.

(b) Give the Truth Tables of OR-gate and realize it using all NAND gates.

- (c) State and prove De Morgan's theorem by truth table. [5+5+4=14]

8. Write Notes on ANY TWO of the following:

[2 x 7=14]

(a) CRO.

(b) LED.

(c) 2-bit analog to digital converter using comparator.

(d) Fabrication of MIC.