BE, 1st semester (Civil, AM, ME, Met, Min) Final Examination, 2012

BASIC ELECTRONICS ENGINEERING

Paper Code: ET 1201

Time: 2 hours **Full marks: 70**

Attempt any Five Questions. All questions are equal valued.

1. How semiconductor material differs from conductor? Mention few popular materials used as semiconductor. What do you mean by intrinsic and extrinsic semiconductor? How n-type and p-type semiconductors are obtained from intrinsic semiconductor and explain their energy band diagram. Define mobility of charge carriers. 2+2+3+5+2=14

2. What is a p-n junction diode? Draw the characteristic curve of forward biased diode and explain its nature. Define cut-in voltage. Write down the diode volt-ampere characteristics equation. Determine the Ge p-n junction diode current for a forward diode voltage of 0.35 at room temperature 25^0C with a reverse saturation current of 10 μA. Here constant K =1 for Ge 2+3+2+3+4 14

3. Describe the physical mechanism of Zener and Avalanche breakdown. How does Zener diode protect a current meter? Show how a Zener diode can be used as a voltage regulator circuit? Determine the maximum and minimum values of Zener current if it is used in a voltage regulator circuit where the load resistance R_L=5kΩ, Rs=10kΩ, Zener voltage Vz=30V and the unregulated supply voltage varies between 100V and 120V. 5+2+3+4=14

4. Draw the circuit diagrams of (i) centre trapped (ii) bridge type fullwave rectifiers and explain their principle of operation. Why bridge type full-wave rectifier is preferred in practice over centre trapped one. Define peak inverse voltage (PIV), and ripple factor. The Primary to secondary turns ratio of centre tapped transformer is 10: 1. Its primary is fed from a 230V a.c. source and secondary is connected to a full wave rectifier. The forward resistance of each diode is 30 ohm and rectifier supplies current to a 2k ohm load. Calculate: i. The dc current in the load and each diode ; ii. Ripple Voltage across the load resistance iii. Efficiency of rectification; iv. PIV for each diode.

4+2+3+5=14

5. What is a load line? Draw the circuit diagram for the collector-to- base bias arrangement of n-p-n transistor in CE configuration and explain the operation principle. Derive the expressions for stability factors with respect to I_{CO}, V_{BE}, and β of this circuit. Define thermal runaway.

3+4+5+2=14

P.T.O.

6. Discuss the difference between FET and BJT. Draw the circuit symbols of and p-channel JFET and depletion type MOSFET. Draw and explain the output characteristics of JFET mentioning three different regions of operation. Discuss the operation principal of depletion type and enhanced type MOSFET.

2+2+6+4=14

7. What should be the characteristics of an ideal OPAMP. What is 'Virtual ground'? How it differs from 'original ground'? Explain with circuit diagram and formula , how following operations can be realized using OPAMP i) Integration ii) Differentiation iii) Addition . Design a non-inverting voltage amplifier using OPAMP.

2+1+1+6+4 =14

8. What do you understand by binary number? Convert the decimal numbers (a) 291 and (b) 0.5347 into binary numbers. Convert the Grey code number 110011 to binary. What is a logic gate? Show symbols of 3 input AND gate and write down its truth table. Draw a circuit containing NAND gates only to realize a XNOR logic function.

2+3+2+2+2+3=14

9. Write short notes (on any four) (31/2 X 4)

(a) Demorgan's theorems
(b) Negative feedback amplifier
(c) Colpitts Oscillator
(d) Cathode ray oscilloscope
(e) Crystal Oscillator
(f)Hybrid parameter modeling of BJT