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(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. FIRST SEMESTER EXAMINATION, DECEMBER 2016

FIRST YEAR [BATCH 2016-19]

Date : 15/12/2016 **ELECTRONICS [General]**

Time : 11 am – 1 pm **Paper : I** Full Marks : 50

Answer ***any five*** questions: [5×10]

1. a) Explain why MOSFETs are advantageous than JFETs.
   b) Draw a schematic of a MOS device and indicate different regions.
   c) Draw and explain the drain characteristics of an *n* channel MOSFET operated in both enhancement and depletion modes.
   d) Define trans-conductance and amplification factor for a FET device. [2+2+4+2]

2. a) Show $I_E = I_B + \alpha\ I_C + I_{CBO}$.
   b) State how I_{CBO} depends on temperature.
   c) Differentiate between BJT and FET.
   d) In an NPN transistor $\alpha = 0.995$, $I_E = 10\,mA$, and $I_{co} = 0.5\ \mu A$. Determine the values of I_C, I_B, β and I_{CEO}. [3+1+3+3]

3. a) What is an insulator? What is Fermi level? Why does a pure semiconductor behave like an insulator at absolute zero temperature.
   b) What do you mean by dynamic resistance of a *pn* junction diode?
   c) Differentiate between Avalanche and Zener Breakdown. [(1+1+2)+2+4]

4. a) What is the need for biasing a transistor?
   b) Explain the formation of depletion region in a *pn* junction diode.
   c) Draw only the Ebers Moll Model of a transistor.
   d) What is ripple factor in terms of a rectifier. [4 × 2½]

5. a) A simple full wave bridge rectifier has an input voltage of 240V ac rms. Assume the diodes to be ideal. Find the dc output current, dc voltage, rms values of output current. Assume load resistance to be 10 KΩ.
   b) Why is silicon widely used for semiconductor material?
   c) Why is emitter always forward biased in a BJT? [7+1+2]

6. a) Why is 'h'-parameter called hybrid?
   b) Derive the different parameters of a transistor in CB mode using 'h' parameter model. [2+8]

7. Write short notes on (**any two**):– [2 x 5]
   a) LED
   b) Early Effect
   c) Load Line
   d) Transistor as a Switch

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