

TEC-201

2005

Even Semester Examination, 2017-18

B.TECH. (SEMESTER-II)

## FUNDAMENTAL OF ELECTRONICS ENGINEERING

Time: 03:00 Hours

Max Marks : 100

Note: Attempt all questions, the marks assigned to each question is indicated at question itself.

1. Attempt any four parts of the following:

{4 × 5}

- (a) Explain the forward characteristics of PN junction with necessary equations for
  - (i) Forward current
  - (ii) Dynamic forward resistance
- (b) Compare JFET with BJT and explain the concept of Pinch-off voltage in MOSFET.
- (c) Explain Zener and Avalanche breakdown mechanisms.
- (d) Describe transition and diffusion capacitance of a silicon diode.
- (e) At 300°K the intrinsic carrier concentration of silicon is  $1.5 \times 10^{16} \text{ m}^{-3}$ . If the electron and hole mobilities are 0.13 and 0.05  $\text{m}^2/\text{V-S}$  respectively. Determine the intrinsic resistivity of silicon at 300°K.
- (f) Compare the CB, CC and CE configuration with respect to various parameters. Why CE configuration is widely used in amplifier circuits?

2. Attempt any four parts of the following :

{4 × 5}

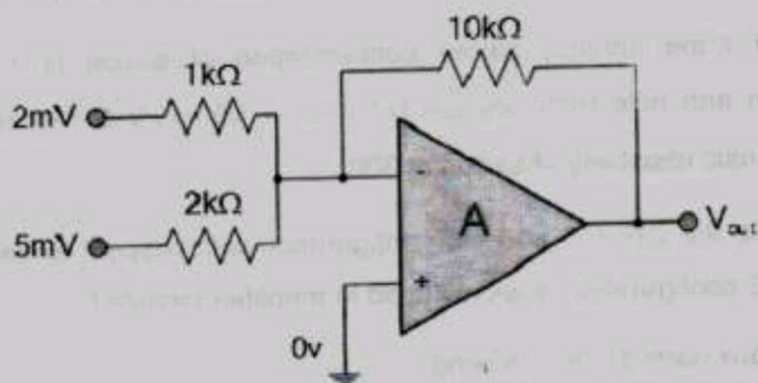
- (a) Define  $\alpha$  and  $\beta$  for transistors and derive the relation for input and output currents for CC configuration as:

$$I_i = (\beta + 1)I_{B1} + (\beta + 1)I_{B2}$$

- (b) Discuss transistor DC load line analysis.
- (c) Derive an equation for rectifier efficiency of a half wave rectifier.
- (d) What are the common-mode and differential-mode signals and hence define CMRR.
- (e) A germanium diode carries a current of 1 mA of room temperature when a forward bias of 0.15 V is applied. Estimate the reverse saturation current at room temperature.
- (f) Explain how operating point is selected for amplification in CE mode using graphical method only.

3. Attempt any two parts of the following: {2 × 10}

- (a) Draw the circuit diagram for transistor in common base configuration and explain about its input and output characteristics. Also indicate cut-off, saturation and active regions in the output characteristic curve.
- (b) What are the requirements for biasing circuit? List types of biasing techniques. Explain the working of a fixed bias circuit.
- (c) Discuss the operation of OP-amp integrator and discuss the concept of virtual and actual ground. Find the output voltage of the following summing op-amp circuit:



4. Attempt any two parts of the following: {2 × 10}

- (a) Describe the principle of operation of an enhancement MOSFET and draw its drain and transfer characteristics.
- (b) State the name of four h-parameters for a transistor and define them. A CE amplifier has the following h-parameters:

$$h_{ie} = 1100 \text{ ohm}, \quad h_{re} = 2.5 \times 10^{-4}$$

$$h_{fe} = 50, \quad h_{oe} = 25 \text{ micro mho.}$$

If the load and source resistance both are 1 kilo-ohm, find current and voltage gain.

- (c) Explain and show the behavior of p-n junction at no bias, forward bias and reverse bias. Also define depletion layer, width of the depletion layer and potential barrier.

5. Attempt any two parts of the following: {2 × 10}

- (a) Show that the NOR gates can realize as OR, AND, NOT, NAND, EXOR gates
- (b) What is necessity of a filter and regulator in a regulated power supply? Draw the output of a full-wave rectifier with capacitor filter and derive its ripple factor. Calculate the value of capacitance to use in a capacitor filter connected to a full wave rectifier operating at a standard aircraft power frequency of 350 Hz, if the ripple factor is 10% for a load of 450 Ω.
- (c) State and prove the De-morgan's theorem and perform the following conversions:

(i)  $(124.21)_8 = (?)_{10}$

(ii)  $(365.217)_8 = (?)_2$

(iii)  $(FACE)_{16} = (?)_{10}$

(iv)  $(847.951)_{10} = (?)_8$

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