

**3 (Sem-1) ELE M 2**

**2017.**

**ELECTRONICS**

**( Major )**

Paper : 1.2

**( Solid State Devices )**

Full Marks : 60

Time : 3 hours

*The figures in the margin indicate full marks  
for the questions*

**1. Answer the following questions : 1×7=7**

- (a) What is a semiconductor?
- (b) What are the two types of semiconductor materials required to form a diode?
- (c) What is the resistance associated with a semiconductor diode?
- (d) Name two common semiconductor materials.
- (e) Name an OP-AMP IC.
- (f) What is a load line?
- (g) For what purpose a BJT is most commonly used?

**8A/400**

*( Turn Over )*

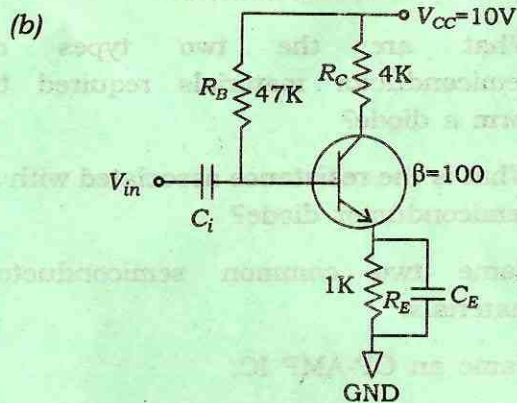
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2. Answer the following questions :  $2 \times 4 = 8$

- (a) What is breakdown in case of a diode?
- (b) What is reverse saturation current in case of BJT?
- (c) What is a feedback? What are its types?
- (d) What are the advantages of a JFET?

3. Answer any three of the following questions :  $5 \times 3 = 15$

- (a) What is a rectifier? Explain the working of a half-wave rectifier. Comment upon rectification efficiency. What are the disadvantages of a half-wave rectifier?



Determine base and collector current for the BJT-network shown above. Assume  $V_{BE} = 0.67V$ .

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(c) Mention a few characteristics of an ideal OP-AMP.

(d) Draw the circuit of an active low-pass filter. Explain its working.

(e) Give a comparison between BJT and FET in terms of its operation and construction.

4. Answer any three of the following questions :  $10 \times 3 = 30$

(a) What are the two junction capacitances seen in a semiconductor? Name them. Derive expressions for formation of junction capacitances showing dependence of donor and acceptor concentrations.

(b) Showing dependencies of donor and acceptor concentrations, derive an expression for barrier potential of a diode.

(c) What are different biasing circuits used with BJTs? Name them. Draw circuits of each of them and outline the advantages and disadvantages of each of them. Derive expressions of load current of each of them.



- (d) How is a MOSFET different from a JFET? Draw a schematic of a MOSFET and describe its working.
- (e) What are different types of coupling used in amplifiers? Name them and explain their working using diagrams.
- (f) What are different types of negative feedback? Draw the circuits and mention the advantages of each of them.
- (g) What are the advantages of negative feedback? Explain using diagrams and mathematical expressions.
- (h) Draw a Schmidt trigger. Explain its working.
- (i) What is an oscillator? What criteria should be fulfilled in order to convert an amplifier into an oscillator? From where the initial trigger voltage of an oscillator is obtained? What are the types of oscillators?

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