B. ETCE. ENGG. EXAMINATION 2017

1st Year, 2nd Semester (Old)

ELECTRON DEVICE II

Full Marks : 100 Time : Three hours

The figures in the margin indicate full marks.

Answer ***any five*** questions.

(*All parts of the same question must be answered together*)

1. Fill in the blanks:

a) The name Varactor means _____ . 1

b) Ohmic contact is formed between *p-Si* / ___ and *n-Si* / ____ . 2

c) For normal operation, LED is _____ biased, photodiode is _____ biased, and solar cell is _____ . 3

d) The three components of current in a forward biased tunnel diode are ____ current, ____ current and ____ current. 3

e) The intrinsic layer makes a PIN diode more ____ and ____than a conventional photodiode. 2

f) A BJT in CE configuration is most suitable for both ____ and ____ . 2

g) Output characteristics of a BJT has three distinct regions: ____ , ____ and ____. 3

h) An SCR is suitable for ____ conversion, while a TRIAC is for _____ conversion. 2

i) The current through a larger MOSFET remains unaltered in a smaller MOSFET, provided their ____ to ____ ratio is same. 2

2.a) Derive expressions for (i) junction potential and (ii) depletion width of a *pn* junction at equilibrium. Also explain that the depletion region extends more in the lightly doped region. 4+6+2

b) Name the capacitances associated with a *pn* junction diode. Describe their origin and the nature of voltage dependence. 8

3. a) Explain the working principle of an LED. Give the reasons of its poor efficiency. Also discuss their remedies. 6+3+5

b) Describe how a solar cell can generate power. 6

4. a) What is Early effect? What are its consequences? 6

b) Define α and β, and establish their relationship. Also discuss the influences of (i) emitter doping and (ii) basc doping on α and β. 4+6

c) "Two diodes placed back-to-back cannot replace a BJT" – justify. 4

5. a) Define *h*-parameters. Give the *h*-parameter representation of a BJT along with the relevant pair of equations. Also draw the same for BJT in CE configuration. 4+4+2

b) What is Thermal runaway? Draw the biasing circuit that most efficiently handles the problem. Also explain role of each element in the circuit. 3+2+5

6. a) Describe the structure of an *n*-channel JFET and explain how the drain current gets saturated in it. 8

b) Define FET parameters. How are they related? 3+3

c) Sketch the Drain and Transfer characteristics of a Depletion MOS and Enhancement MOS. 3+3

7. Write notes on **(any two)**: 2x10

(a) Diode breakdown

(b) Tunnel diode

(c) UJT

(d) VMOS.