

B.E. Electronics and Tele-Communication Engineering Examination 2018

(First Year - Second Semester)

ELECTRON DEVICE

Full Marks: 100

Time: Three hours

The figures in the margin indicate full marks.

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

1. Fill in the blanks: 14
- i) Contribution to conductivity of a semiconductor comes from ---- of majority carriers and ---- of minority carriers.
 - ii) Built-in potential of a diode of ---- band gap semiconductor is larger.
 - iii) The nature of a contact formed between p -Si and Al is ----, while that between p -Si and Ag is ----.
 - iv) An opto-coupler is combination of an ---- and a ----.
 - v) The most common LCD is ---- type.
 - vi) Doping levels in a Tunnel diode are ---- than those in a Backward diode.
 - vii) The biasing arrangement that most efficiently eliminates Thermal Runaway in BJT is ----.
 - viii) A BJT with ---- configuration is most useful as both amplifier and switch.
 - ix) The condition of Strong Inversion in a MISFET is ----.
 - x) VMOS is a ---- MOSFET.
 - xi) TRIAC is the full form of ----.
2. Answer any TWO: 2x14=28
- a) Derive an expression for width of the depletion region in terms of doping levels of a step p - n junction under equilibrium.
 - b) Sketch the minority carrier distribution in a p^+-n junction diode and its energy band diagram under (i) Equilibrium, (ii) Forward bias and (iii) Reverse bias.
 - c) Describe two primary mechanisms responsible for breakdown in p - n junction diode under reverse bias.

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3. Answer any TWO: 2x14=28
- a) Describe the operation of a solar cell. Mention reasons behind poor efficiency of a conventional solar cell and discuss how its performance can be improved.
 - b) Derive the Current – Voltage relationship in a JFET for the (i) Linear and (ii) Saturation regions. Make assumptions necessary for that.
 - c) Draw the Current – Voltage characteristics of an UJT and explain it. Also discuss how location of the single junction optimizes performance of an UJT switch.
4. Answer any TWO: 2x7=14
- a) Discuss the means for reducing diode switching time.
 - b) 'A BJT cannot be constructed by simply placing two diodes back-to-back.' Justify the statement with the help of Ebers - Moll model.
 - c) Draw and compare the small signal equivalent circuits for BJT (CE configuration) and FET (CS configuration).
5. Answer any TWO: 2x8=16
- a) Explain why a PIN diode is more efficient and faster than a traditional photodiode.
 - b) Classify semiconductor hetero-junctions with a mention of their features.
 - c) Describe how both high speed and high gain can be achieved in a HBT.