

Registration No:

--	--	--	--	--	--	--	--	--	--

Total Number of Pages : 02

M.TECH

M.TECH 1ST SEMESTER REGULAR EXAMINATIONS, DECEMBER 2017

RF SOLID STATE DEVICES

Branch: EC, Subject Code:MECPE1042

Time: 3 Hours

Max Marks : 70

The figures in the right hand margin indicate marks.

PART-A**(2X10=20 MARKS)****1. Answer the following questions .**

- A certain Gas MESFET has channel height=0.1 μ m, electron concentration= $8 \times 10^{17}/cm^3$, Relative dielectric constant= 13.10, Calculate the pinch-off voltage.
- Which factors limit the operation of low frequency transistors in GHz region?
- Draw the energy band diagram of a reverse biased p-i-n photo detector under illuminated condition.
- Draw the practical circuit of LED. How do we protect LED against reverse voltage?
- List the uses of solar cells.
- Differentiate conductors, semiconductors and insulators on the basis of band gap.
- Which MOSFET is called as Normally ON MOSFET and NORMALLY OFF MOSFET? Why?
- Will a transistor result if two diodes are connected back to back? Justify
- Differentiate between microwave transistors and transferred electron device.
- What is the operating life a silicon photodiode?

PART-B**(5 X 10=50 MARKS)****Answer any five questions from the following.**

- Consider a pn-junction formed from uniformly (constant) doped p- and n-type semiconductor regions. Assume one dimension.
 - Derive expression for the minority carrier currents on each side of the junction. **5**
 - Sketch the hole, electron and total currents which flow through the device for forward and reverse biases. **5**
- Using Ebers-Moll Model, derive the expression for collector-emitter saturation voltage of a bipolar transistor. **5**
 - Calculate the collector- emitter saturation voltage of a bipolar transistor at T=300K. **5**
Assume that , $\alpha_F = 0.99$, $\alpha_R = 0.20$, $I_C=1mA$, $I_B = 50\mu A$.

- | | | |
|----|--|---|
| 4. | a. Describe the characteristics and operation mechanism of microwave. | 8 |
| | b. Why FETs are preferred to bipolar transistors for low-noise applications? | 2 |
| 5. | a. Derive the expression for cut off frequency and maximum oscillation frequency. | 6 |
| | b. What is MESFET? What are the advantages of MESFET? | 4 |
| 6. | a. Define pinch off voltage. Derive the mathematical formula for the same. | 7 |
| | b. What are the applications and different areas in which microwave bipolar transistor is implemented? | 3 |
| 7. | a. Describe the hybrid π equivalent model of CE configuration for small signal analysis. | 8 |
| | b. What do you mean by transition probability in optical devices? | 2 |
| 8. | a. Describe the operation and application of MOSFET. | 5 |
| | b. Derive the expression for transistor cut-off frequency. | 5 |

==0==