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Roll No. : .....

**328353(28)**

**B. E. (Third Semester) Examination, Nov.-Dec. 2021**  
**(New Scheme)**

**(Electronics and Telecommunication Engineering Branch)**

**ELECTRONIC DEVICES and CIRCUITS**

***Time Allowed : Three hours***

***Maximum Marks : 80***

***Minimum Pass Marks : 28***

***Note : (i) Attempt all questions. Part (a) of each question is compulsory carrying 2 marks. Attempt any two parts from part (b), (c) & (d) of each question carrying 7 marks.***

**Unit-I**

1. (a) State and mathematically express the Einstein's relation for diffusion.

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- (b) Calculate the ratio of the current for a forward biased of a 0.06 V to the current for the same value of reversed biased applied to a germanium p-n junction Diode at temperature 27° C. 7
- (c) Discuss the potential, electric field and charge density inside depletion layer of p-n junction. 7
- (d) Explain drift current density. The electron concentration in a sample of Ge at 300° K vary linearly from  $10^{17}/\text{cm}^3$  at  $x = 0 \mu\text{m}$  to  $6 \times 10^{16}/\text{cm}^2$  at  $x = 2 \mu\text{m}$ . Find the current density in the Ge bar. Assume N-type sample. 7

### Unit-II

2. (a) Explain the V-I characteristics of ideal p-n junction diode. 2
- (b) Draw the circuit of centre-trapped and Bridge rectifier. Compare both the rectifier on the following points  $I_{dc}$ ,  $I_{rms}$ , TUF, ripple factor and  $\eta$ . 7
- (c) Compare diffusion capacitance and Transition

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- Capacitance across depletion Layer of PN Junction Diode. 7
- (d) A full wave P-N diode rectifier uses load resistor of 1500  $\Omega$  no filter is used. Assume each diode to have idealized characteristics with  $R_f = 12 \Omega$  and  $R_r = \infty$ . Cut in voltage may be neglected since wave voltage applied to each diode has amplitude of 32 volts and frequency of 50 Hz. Calculate : 7
- (i) D. C. current
- (ii) D. C. Voltage
- (iii) D. C. power  $\alpha/p$
- (iv) A. C. i/p power
- (v) Rectifier efficiency
- (vi) Ripple factor
- (vii) Form factor

### Unit-III

3. (a) What is early effect? 2
- (b) Draw the input and output characteristics of common

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- emitter configuration. Explain active, saturation and cut-off region. 7
- (c) Explain voltage divider biasing for BJT and find the value of stability factor  $S$ , and  $S'$ . 7
- (d) What is the relation between  $\alpha$  and  $\beta$ ? Explain using transistor current equation. 7

**Unit-IV**

4. (a) Draw small signal model of JFET and explain the various parameters used in the model. 2
- (b) What are the advantage of FET over BJT and why FET is called unipolar? 7
- (c) Explain VI characteristics of JFET. Prove that  $g_m = \left( \frac{2}{|V_p|} \right) (I_D I_{DSS})^{0.5}$ . 7
- (d) Explain how to bias FET in the active region to work as CS amplifier. Derive the expression for : 7
- Input Impedance;
  - Output Impedance;
  - Voltage Gain

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**Unit-V**

5. (a) Explain the difference between D-mode MOSFET and E-mode MOSFET. 2
- (b) Draw the symbol of D-MOSFET and E-MOSFET and also explain the operation of E-MOSFET. 7
- (c) Draw the circuit of CMOS 2-input NOR gate and 2-input NAND gate. 7
- (d) Determine  $I_{DQ}$  and  $V_{DSQ}$  for the enhancement type MOSFET for the given circuit. 7

