

II B. Tech I Semester Regular Examinations, Dec - 2015
BASIC ELECTRONICS AND DEVICES
(Electrical and Electronics Engineering)

Time: 3 hours

Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

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**PART -A**

1. a) What is Hall effect ?Explain. (3M)
- b) What are the differences between Drift and Diffusion Capacitance (3M)
- c) What is the difference between series and Shunt regulators. (4M)
- d) What is meant by Thermal runaway? (4M)
- e) Explain the working principle of n-MOSFET (4M)
- f) What are the advantages of negative feed back system (4M)

**PART -B**

2. a) Explain the classification of Insulators, Semi conductors, and Metals using Energy Band Diagrams (8M)
- b) Explain about Mobility, Conductivity and Drift current with suitable diagrams. (8M)
3. a) Draw and explain the construction of PN junction diode (8M)
- b) Explain the temperature dependent characteristics of PN junction diode (8M)
4. a) Explain the significance of Rectifiers with filters, and what are the advantages of capacitor filter over Inductor filter (8M)
- b) What are the different types of regulators? Explain any one of the regulators. (8M)
5. a) What is DC load line? What is the stability criterion. (8M)
- b) Explain the criteria of fixing Operating point. (8M)
6. a) List out the comparisons of power devices. (8M)
- b) Draw the small signal model of JFET (8M)
7. a) Explain the principle and operation of Negative feedback amplifier? What are the advantages of Negative feedback amplifier? (8M)
- b) What are the four configurations of Negative feedback amplifiers? Explain any one of the configurations. (8M)



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**PART -A**

1. a) What are P and N type semiconductor (3M)
- b) What are the differences between Static and Dynamic resistances? (4M)
- c) Define the terms Ripple factor, Regulation and efficiency. (4M)
- d) How does the transistor amplifies the input signal? Explain. (3M)
- e) Sketch the simple FET and Explain. (4M)
- f) What are the conditions for Oscillation? (4M)

**PART -B**

2. a) Explain Fermi level in Intrinsic, Extrinsic semi conductors with necessary mathematics (8M)
- b) With a neat sketch explain the phenomena of Hall Effect in semiconductors (8M)
3. a) Explain the operation of varactor diode with neat diagram (8M)
- b) Design a Zener diode regulator to meet following specifications. Unregulated DC input voltage  $V_i=15\pm 10V$  regulated DC output  $V_o=8V$ .  $I_{Zmin}=6mA$ ,  $I_{Zmax}=85mA$ , Load current  $I_c=20 Ma$  (8M)
4. a) Define and derive the terms as referred to HWR circuit. i) PIV ii) Average d.c. voltage . iii) RMS current. iv) Ripple factor. (12M)
- b) Explain about over load voltage protection. (4M)
5. a) Explain the differences of CB, CE and CC configurations. (8M)
- b) For a transistor the leakage current is  $0.2 \mu A$  in CB configuration, while it is  $18 \mu A$  when it is connected in CE configuration. Calculate  $\alpha_{DC}$ , and  $\beta_{DC}$  of the same transistor (8M)
6. a) Draw and explain the low frequency modulo of JFET. (8M)
- b) For an N channel JFET  $I_{DSS}$  is  $8mA$  and  $V_P$  is  $-5V$ , determine minimum value of  $V_{DS}$  for Pinch off region and determine current  $I_D$  for  $V_{GS}$  of  $-2V$ . (8M)
7. a) Draw the circuit diagram of RC phase shift oscillator, Explain how Barkhausen conditions are satisfied. (8M)
- b) Explain the principle and operation of Negative feedback amplifier? What are the advantages of Negative feedback amplifier. (8M)



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**PART -A**

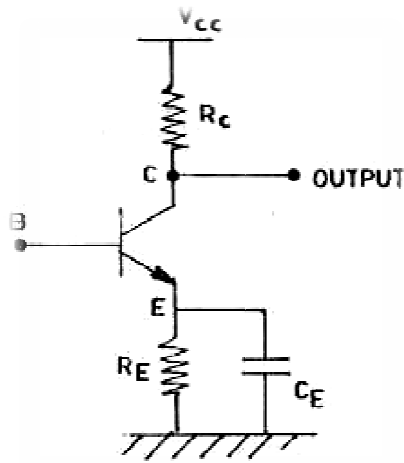
1. a) What are the differences between the intrinsic and extrinsic semiconductors? (4M)
- b) Explain the dependency of Reverse saturation current on temperature. (3M)
- c) What is the difference between full wave and Bridge rectifiers? (4M)
- d) Define  $\alpha$  and  $\beta$  of a Transistor. (3M)
- e) What are the differences between BJT and FET? (4M)
- f) What are the differences between positive and negative feedback systems. (4M)

**PART -B**

2. a) State and prove continuity equation. (8M)
- b) In a Ge PN Junction at 300<sup>0</sup> k have the following parameters  $L_D=5 \times 10^{18}/\text{cm}^3$ ,  $L_A=6 \times 10^{16}/\text{cm}^3$ ,  $n_i=1.5 \times 10^{10}/\text{cm}^3$ . Calculate the minority electron density in p-region and minority hole density in n-region. (8M)
3. a) Explain the Zener and Avalanche thermal breakdown mechanisms. What will be their thermal coefficients? (8M)
- b) Explain the principle and operation of tunnel diode with energy band diagrams (8M)
4. a) Construct Bridge rectifier circuit and derive equation for  $I_{DC}$ ,  $V_{DC}$ ,  $I_{RMS}$ ,  $V_{RMS}$ , and Rectifier efficiency. (8M)
- b) A diode whose internal resistance is 20ohms is to supply power to a load of 1 K $\Omega$  from 110 V (rms) source of supply. Calculate i) Peak load current ii) DC load current iii) AC load current iv) DC diode voltage v) Total input power vi) Peak Inverse voltage vii) % of regulation viii) Efficiency (8M)



5. a) Write the current components of NPN transistor. With neat sketch. (8M)
- b) For a CE amplifier circuit shown in the figure the transistor parameters are (8M)  
 $R_C = 10K\Omega$ ,  $R_E = 2K\Omega$ ,  $h_{ie} = 2K\Omega$ ,  $h_{fe} = 60$ ,  $h_{oe} = 10\mu mhos$ ,  $h_{re} = 1 \times 10^{-4}$ .  
 Assuming  $R_E$  is adequately bypassed by a capacitor  $C_E$ . Construct small signal equivalent model and Calculate  $A_I$ ,  $A_V$ .



6. a) Explain the operation of enhancement mode NMOSFET (8M)
- b) Explain the Differentiate between BJT, JFET and MOSFET (8M)
7. a) Draw the circuit diagram of Colpits oscillator, Explain how Barkhausen conditions are satisfied. (8M)
- b) Draw crystal controlled oscillator circuit. and Mention some of its applications. (8M)



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**PART -A**

- 1 a) Explain about Generation and Recombination of Charges (3M)
- b) Explain the differences between Avalanche and Zener break down. (4M)
- c) With respect to rectifiers, define  $V_{rms}$ ,  $I_{rms}$ , PIV and TUF (4M)
- d) Draw and explain the self biasing technique. (3M)
- e) What are the applications of FET. (4M)
- f) Write the conditions for sustained Oscillations for Collpits Oscillator (4M)

**PART -B**

- 2 a) Explain about Hall Effect. And list the applications. (8M)
- b) Find the concentration of holes & electrons in the P-type silicon at 300<sup>0</sup>K assuming its resistivity as 0.02Ω-cm,  $\mu_p=475\text{cm}^2/\text{vs}$  ,  $\eta_i=1.45\times 10^{10}/\text{cm}^3$ . (8M)
- 3 a) Explain the operation of PIN diode with neat diagram (8M)
- b) Find the value of DC resistance and AC resistance of a Ge diode at 25°C with  $I_0$  of 25 μ A at an applied voltage of 0.2 V. (8M)
- 4 a) Define and derive the terms as referred to FWR circuit. i) PIV (8M)  
 ii) Average d.c. voltage iii) RMS current iv) Ripple factor.
- b) What is the regulated power supply? Explain the operation of Zener diode regulator (8M)
- 5 a) Define h-Parameters of a transistor. Draw and explain the equivalent circuit of BJT. (8M)
- b) Explain the operation of Transistor CE configuration. And also draw the input and output characteristics. (8M)
- 6 a) Explain the AC, DC analysis of JFET. (8M)
- b) Draw and explain the static and transfer MOSFET characteristics? (8M)
- 7 a) Draw the circuit diagram of Heartley oscillator, Explain how Barkhausen conditions are satisfied. (8M)
- b) Explain the principle and operation of Negative feed back amplifier? What are the advantages of Negative feed back amplifier? (8M)

