

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY- GURAJADA VIZIANAGARAM**  
**II B. Tech I Semester Regular Examinations, November – 2024**  
**ELECTRONIC DEVICES AND CIRCUITS**  
**(Electronics and Communication Engineering)**

**Time: 3 hours****Max. Marks: 70**

*Question paper consists of Part A, Part B.*  
*Part A is compulsory, Answer all questions.*  
*In Part B, Answer any one question from each unit.*

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**PART-A****(20 Marks)**

- 1 a) Write down the P-N Junction Diode Current Equation and present the significance of each parameter involved in the equation. [2]
- b) Define the term “Ripple Factor” and present the theoretical values of ripple factor for various rectifiers. [2]
- c) Draw Ebers-Moll model of a Bipolar Junction Transistor. [2]
- d) Present the concept of an early effect related to BJT. [2]
- e) Draw the small signal equivalent circuit diagram of JFET. [2]
- f) Draw the circuit diagram of CMOS inverter. [2]
- g) Define the terms, stability factors S and S'. [2]
- h) Draw the hybrid model of a transistor. [2]
- i) List out transistor Hybrid- $\pi$  parameters. [2]
- j) How to determine the bandwidth of a transistor amplifier with neat sketch. [2]

**PART-B****(50 Marks)****Unit-1**

- 2 a) Explain the operation of p-n junction diode with the help of energy band diagrams. [5]
  - b) Estimate the value of series resistor for a Zener diode regulator if Zener voltage is 11.8V, dissipation rating of the Zener diode as 400mW and the variation in the input DC voltage is between 17V and 19.5V. State clearly the assumptions, if any. [5]
- (OR)
- 3 a) Define and derive the expressions for various characteristics of rectifiers. [5]
  - b) Two identical Germanium diodes are connected back-to-back with 10V battery. Find out the voltages across each diode, making proper assumptions. [5]

**Unit-2**

- 4 a) With neat diagram explain various current components in a bipolar junction transistor. Write transistor current equation. [5]
  - b) A p-n-p transistor has beta value of 50 and reverse saturation current of -2 micro amperes. CE configuration is used with collector to emitter voltage of negative 12V and collector load resistance of 4K ohms. What is the minimum base current value required to saturate the transistor? [5]
- (OR)
- 5 a) With neat circuit diagram explain the characteristics of bipolar junction transistor in CC configuration and specify the regions of operation. [5]
  - b) A bipolar junction transistor has base current of 100 micro amperes and collector current of 2mA. Find (a) beta of the transistor (b) alpha of the transistor (c) emitter current and (d) if base current changes by 25 micro amperes and collector current changes by 0.6 mA, find the value of beta. [5]

**Unit-3**

- 6 a) Draw and explain the operation of n-channel JFET with the aid of construction and output characteristics. [5]  
 b) A JFET device has a drain current of 8 mA when a drain voltage of 5V is applied to it with gate-source terminals shorted. When the drain voltage is increased to 10V there is a small increase in the drain current of 8.2 mA. When the gate-source voltage is made negative 0.4V, the drain current decreases to 7mA. Determine the type of the JFET and its parameters. [5]

(OR)

- 7 a) Draw and explain the construction, operation and characteristics of enhancement MOSFET, in brief. [5]  
 b) Draw the circuit diagram of BiCMOS inverter and explain its operation. [5]

#### Unit-4

- 8 a) What are the various biasing methods available for BJT? Draw the self-bias circuit and perform its analysis. [5]  
 b) Determine current gain, input resistance, voltage gain, output resistance and power gain for a common emitter amplifier using a transistor with  $h_{ie} = 1.2K$  ohms,  $h_{fe} = 36$ ,  $h_{re} = \text{zero}$  and  $h_{oe} = 2$  micro mho. Use load resistance of 2.5K ohm and source resistance of 500ohm. Neglect the effect of biasing circuit. [5]

(OR)

- 9 a) Explain how to determine the h-parameters from two-port network and draw the generalized hybrid model of a transistor. [5]  
 b) A transistor amplifier has the values of  $V_{CC}=12V$ ,  $R_1=8$  K ohm,  $R_2=4$  K ohm, Collector Resistance of 1K ohm, Emitter Resistance of 1K ohms and Load Resistance of 1.5K ohm. Assume  $V_{BE}=0.7V$ . Determine the operating point and perform load line analysis. [5]

#### Unit-5

- 10 a) Perform the exact and approximate analysis of small signal low frequency single stage CE amplifier using hybrid model. [5]  
 b) Explain how to determine CE short circuit current gain using small signal high frequency equivalent circuit of a transistor. [5]

(OR)

- 11 a) Perform the analysis of small signal high frequency FET common source and common drain amplifier circuits. [5]  
 b) Draw the small signal high frequency BJT Hybrid- $\pi$  model and determine the hybrid- $\pi$  conductance. [5]

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