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B. TECH. Ist - Year

FIRST SEMESTER EXAMINATION, 2007-2008

TEC-101 BASIC ELECTRONICS

Time : 3 *Hours* *Maximum Marks : 100*

Note : Attempt any *FIVE* questions.

1. (*a*) Explain graphically, why the energy levels of an atom become energy bands in a solid. Show the variation of energy levels with atomic distance. **(5)**

(*b*) On the basis of energy band gap theory, explain the formation of valence band. Differentiate among conductors, insulators and semiconductors. **(5)**

(*c*) Reverse saturation current of a Si Diode is 0·3 µA. Calculate its forward resistance at an applied voltage of 1 V. **(5)**

(*d*) Determine the rating of a transformer secondary to deliver a 100 W of dc power to a load under full-wave and half-wave rectifiers. **(5)**

2. (*a*) Define the following terms :

(*i*) Knee voltage

(*ii*) Peak Inverse voltage

(*iii*) Reverse saturation current

(*iv*) Breakdown voltage

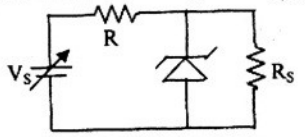
(*v*) Ideal diode **(10)**

(*b*) Determine ac resistance for a semiconductor silicon diode having forward bias of 200Mv and reverse saturation current of 1µA at room temperature. **(5)**

(*c*) Explain the break mechanism which occurs in Zener diode. **(5)**

3. (*a*) What are clipping circuits? Draw the output waveform for positive and negative clippers if the input is sinusoidal. Also explain the operation of combinational clipper for a square input. **(10)**

(*b*) Draw the V-I characteristics of a zener diode and explain how does a zener regulate a voltage. The input voltage for the figure shown below varies from 35 to 45 volt, V_Z = 20 V, r_z = 5 ohm, $I_{L(min)}$ = 0 mA, $I_{L(max)}$ = 100 mA, $I_{Z(min)}$ = 10 mA, $I_{Z(max)}$ = 400 mA. Find the value of R_L, R and $P_{Z(max)}$. **(10)**



4. (*a*) Draw and explain the input and output characteristics of a BJT in CE configuration, indicating the operating regions. Derive the relationship between α, β and γ. Explain why CE configuration is most widely used in amplifier circuits. **(10)**

(*b*) Determine pinch off voltage, amplification voltage and drain resistance of FET. Explain the volt ampere characteristics of FET. Using suitable circuit arrangement, derive the relationship $\mu = r_d \times g_m$. **(10)**

5. (*a*) What is significant difference between the construction of an enhancement type MOSFET and depletion type MOSFET ? Explain with suitable diagram. **(7)**

(*b*) Differentiate between BJT and FET. What are the advantages of the FET over a conventional BJT ? **(7)**

(*c*) Draw the ac equivalent circuit of a common source amplifier, and find the expression for voltage gain. **(6)**

6. (*a*) Perform the following conversions :

(*i*) $(1BE)_{16}$ = ( )$_8$

(*ii*) $(676)_8$ = ( )$_2$

(*iii*) $(321)_4$ = ( )$_{10}$

(*iv*) $(10101.001)_2$ = ( )$_8$ **(6)**

(*b*) Add and subtract the following numbers without converting to decimal numbers :

$(4F3A)_{16}$ and $(23C1)_{16}$ **(7)**

(*c*) Minimize the following Boolean function using K-map :

$F = \overline{W}(\bar{x}y + \overline{xy} + xyz) + \overline{xz}(y + w)$

$d = \overline{w}x(\bar{y}z + y\bar{z}) + wyz$

Also find the POS from the above simplified Boolean expressions. **(7)**

7. (*a*) List any five ideal characteristics of an operational amplifier. Also define the following terms :–

(*i*) CMRR (*ii*) slew rate (*iii*) PSRR (*iv*) input offset voltage. **(10)**

(*b*) Explain, with the help of a neatly labeled circuit diagram, how an amplifier can be used as (*i*) Differentiator, (*ii*)Integrator, (*iii*) Adder and (*iv*) Difference Amplifier. **(10)**