

Time: 3 hours

Full marks:70

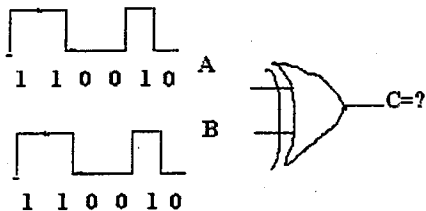
(Answer Any Five Questions)

1.
 - a) Discuss the forward and reverse bias characteristics of a p-n junction diode.
 - b) What do you understand by cut in and breakdown voltage in p-n junction diode?
 - c) Briefly discuss the breakdown mechanisms of a diode.
 - d) Amongst Si and Ge diodes which one is having larger leakage current and why?
5+4+3+2=14
2.
 - a) Discuss the operation of a full wave bridge rectifier with resistive load
 - b) For a half wave rectifier with resistive load calculate i) efficiency ii) ripple factor
 - c) What is the significance of PIV in case of rectifier circuits?
 - d) What is the importance of studying stability factors of BJT biasing circuits?
4+4+3+3=14
3.
 - a) What is meant by series clipper and shunt clipper?
 - b) What is a Zener diode? How does Zener diode protect a current meter?
 - c) Show how a Zener diode can be used as a voltage regulator circuit?
 - d) Determine the maximum and minimum values of Zener current if it is used in a voltage regulator circuit where the load resistance $R_L=5k\Omega$, $R_S=10k\Omega$, Zener voltage $V_Z=30V$ and the unregulated supply voltage varies between 100V and 120V.
3+4+3+4=14
4.
 - a) Explain α and β factors of a transistors. Derive expressions for them and state their meaning.
 - b) Can transistor action be realized by connecting two back-to-back diodes? Justify your answer.
 - c) What is thermal runaway?
 - d) A Ge BJT is used in an amplifier circuit in CE mode. It has a collector leakage current $I_{co} = 10 \mu A$ at a temperature of $25^{\circ}C$ and $\beta = 50$. Find the collector current if the transistor's temperature rises to $45^{\circ}C$. Base current $I_B = 0.25mA$
4+2+3+5=14
5.
 - (a) In n-type semiconductor number of electron is higher than that of hole; therefore a n-type semiconductor is as a whole negatively charged"---Justify.
 - (b) Discuss 'Early effect' in BJT.
 - (c) Discuss the advantages and disadvantages of positive and negative feedback in amplifier operation.
 - (d) Why BJT base region is made thinner and is most lightly doped (compared to emitter and collector)?
3+4+4+3=14
6.
 - a) Draw the circuit symbols of n-channel and p-channel JFETs.
 - b) Draw and explain the output characteristics of JFET mentioning three different regions of operation.
 - c) Discuss the difference between JFET and BJT.
2+8+4=14

7. a) What should be the characteristics of an ideal OPAMP.
 b) What is 'Virtual ground'? How it differs from 'original ground'?
 c) For a non-inverting amplifier using OPAMP having gain of 20, what should be the values of R_i and R_f ?
 d) How can i) Integrator ii) Differentiator be realized using OPAMP

3+3+3+5=14

8. a) Give the Truth Table of AND-gate and realize it using all NOR gates.
 b) If the two inputs of a XOR gate are like below, then draw the output waveform.



- c) State De Morgan's law.
 d) Realize EXCLUSIVE-OR gate using only NAND gates.

4+3+3+4=14