# CC7

## Analog Systems and Applications

### I. One mark questions.

1. The band gap of semiconductors is nearly _____ eV.
2. The temperature coefficient of resistance of silicon is _____ .
3. The semiconductors are _____ at low temperature.
4. A zener diode is a properly doped crystal diode having a _____ voltage.
5. A zener diode is used as a _____ .
6. Half wave rectifier does not conduct current during _____ half cycles of input AC voltage.
7. _____ is the middle portion of the transistor.
8. In a transistor _____ is lightly doped.
9. _____ is the zero signal values of the collector current and the collector emitter voltage.
10. _____ is the ratio of output current to input current.
11. _____ is the ratio of output voltage to input voltage.
12. _____ is the ratio of output power to input power.
13. _____ is the difference between upper cut-off frequency and lower cut-off frequency.
14. RC-coupled amplifier has low _____ and _____ gain.
15. RC-coupled amplifier has _____ impedance matching.
16. The output impedance of the amplifiers is _____ by the negative feedback.
17. Output noise is increased by _____ feedback in amplifiers.
18. Negative feedback _____ the frequency and phase distortion.
19. Sinusoidal oscillator produces _____ waves.
20. An oscillator converts _____ energy into _____ energy.
21. _____ oscillators are oscillators having positive feedback.
22. An ideal OP-AMP has _____ voltage gain and _____ input impedance.
23. IC-741 has output impedance less than _____ .
24. An ideal OP-AMP has _____ output impedance.
25. The inverting amplifier acts as _____ .
26. An adder is known as _____ .
27. The output signal _____ in magnitude and _____ in phase to the input signal.
28. _____ is a device that produces an analog output from a digital input.
29. _____ conversion involves translation of digital information into analog information.
30. _____ is a device that produces a digital output from an analog input.

### II. 1.5 mark questions.

1. What is PN - Junction?
2. What is an abrupt PN - Junction ?
3. What is a linearly graded PN - junction ?
4. Draw the wave -forms of input A.C. voltage and output D.C. voltage for a half wave rectifier.
5. Draw the wave-forms of input A.C. voltage and output D.C. voltage for a full -wave rectifier.
6. Determine the value of base current in a common base transistor connection if $I_E$ = 5 mA and $I_C$ = 2 mA.
7. In a common base configuration of a transistor the emitter current is 4 mA and the current amplification factor is 0.99. Find the base current.
8. What are voltage amplifiers ?
9. What is power amplifiers ?
10. What are audio amplifiers ?
11. What is a multistage amplifier ?

12. Find the band width if lower cut -off frequency is 20 Hz for an RC coupled amplifier and upper cut-off frequency is 25 Hz.
13. What is the use of coupling network in an amplifier ?
14. What do you mean by feedback in amplifiers ?
15. What is Barkhausen criterion for self sustainedoscillation ?
16. Give the circuit diagram of an RC phase sift oscillator ?
17. What is an operational amplifier ?
18. What is an ideal OP AMP ?
19. What do you mean by slew rate ?
20. What is an inverter ?
21. What is a voltage follower ?

## III. 2.5 mark questions.

1. Find the resistivity of a sample of N germanium at 300 K having donor density $N_D = 10^{30}$ atoms $m^{-3}$.
2. Find the donor density and hole density in an N germanium crystal with a resistivity of 0.3 ohm.m at 300 K.
3. The rms value of input A.C. voltage applied to a bridge full-wave rectifier is 220 V and the load resistance is 600 Ω.Calculate the average load current and the power dissipated in each diode of forward resistance 4 Ω.
4. The rms value of alternating supply voltage for a bridge full wave rectifier is 25 V and theload resistance is 500 Ω. Find the PIV and the maximum load current if the forward resistance of each diode in the bridge is 2 Ω.
5. In a common base transistor connection $\alpha = 0.98$. The voltage drop across the collector load of 4 kΩ is 4V. Find the base current.
6. Determine the values of collector current and collector-base voltage of the following common base silicon transistor.
7. What are the different methods of biasing a transistor ?
8. Find the stability factor and base current in a voltage divider circuit using a silicon transistor with $\beta = 50$. Given $R_1 = 10k\Omega$, $R_2 = 5k\Omega$, $R_E = 2k\Omega$, $V_{CC} = 20V$.
9. An RC-coupled amplifier in CE mode with a load $R_L = 40$ kΩ. The hybrid parameters of transistor are $h_{fe} = 300$ and $h_{ie} = 10k\Omega$. Determine the overall voltage gain for the mid frequency range with three stages cascaded.
10. A two stage RC - coupled amplifier uses transistor having hybrid parameters $h_{ie} = 10k\Omega$,$h_{fe} = 300$. If the load resistance $R_L$=15 kΩ, then find the coupling capacitor for the lower cut off frequency to be 30 Hz.
11. Prove that negative feedback improves the stability of gain of an amplifier.
12. An LC oscillator circuit is used in radio receiver. Determine the frequency of oscillation if L = 40 µH and C = 100 pF.
13. Determine the capacitance of the capacitor required to construct an LC oscillator which uses an inductor of 2 µH to produce a sine wave of frequency 2 MHz.
14. For an OP AMP $A_d = 1000$ and $A_C = 80$. Find the value of CMRR.
15. For an operational amplifier, $A_d = 4000$ and CMRR = 200. Find the voltage gain for mode input signal.
16. Determine the resolution of a 7 bit R - 2R ladder D/A converter. What is its resolution is expressed in percentages ?
17. How many bits are required at the input of a D/A converter if it is necessary to resolve voltages to 10 mV and the converter has a + 10V full scale?

## IV. 5 marks questions

1. What is PN-junction diode? Derive an expression for PN-junction diode equation and explain reverse saturation current.
2. Explain junction barrier of PN-junction diode. Then derive expressions for barrier potential and width for a step junction.
3. How barrier potential is formed across a PN-junction. Write the theory for drift velocity and current for the junction. Describe the current flow mechanism in forward and reverse biased PN-junction.
4. Describe full wave bridge rectifier and find its efficiency and ripple factor. Describe the principle and function of solar cell with necessary figures.
5. With neat circuit diagram describe the construction and working of N-P-N transistor in CE mode. Also discuss about its various characteristics.
6. Draw the circuit to study N-P-N transistor in C-C mode. Describe the working of transistor and draw characteristics curves.
7. What is transistor biasing? Then derive an expression for stability factor of voltage divider bias method for N-P-N transistor of VE configuration.
8. Define four parameters for a CE mode of transistor amplifier. Obtain current gain, voltage gain and power gain in terms of 4-parameters.
9. With neat block diagram describe the voltage gain of the negative feedback amplifier. Then describe the effects like gain, stability, input impedance and output impedance of negative feedback in amplifiers.
10. Describe R-C coupled amplifier with circuit and study its working in different frequency regions using voltage gains.
11. Describe Colpitt's Oscillator with hybrid parameter circuit and obtain condition of Oscillation and frequency of Oscillation where it is used.
12. With neat circuit diagram describe the working of RC phase shift oscillator. Also obtain condition of oscillation and derive an expression for frequency of the oscillation.
13. With a neat circuit explain the working of an OP-AMP as an non inverting amplifier. Find the expression for closed loop voltage gain.
14. What is an OP-AMP? Give its block diagram. Explain the function of each part.
15. Draw the circuit symbol of IC 741 OP-AMP. Give its Packing and pins out.
16. Describe the theory and function of Wien Bridge Oscillator using OP-AMP. Write its merit and drawbacks.
17. With neat circuit diagram describe the working of an OP-AMP as an Inverting amplifier with expression for open loop voltage gain.
18. With neat circuit diagram describe the working of integrator and differentiator using OP-AMP.