

Analog Electronics (313324)

MSBTE Diploma · K-Scheme · Model Question Paper — Set C

Time: 3 Hours**Max. Marks: 70****Instructions:**

1. All questions are compulsory.
2. Answer each next main question on a new page.
3. Illustrate your answers with neat sketches wherever necessary.
4. Figures to the right indicate full marks.
5. Assume suitable data, if necessary.
6. Mobile phone, pager and any other electronic communication devices are not permissible in the examination hall.

Q.1 Attempt any FIVE of the following:**10**

- a) State the need of heat sink in a power amplifier.
- b) Define: i) Input offset voltage ii) Input bias current
- c) Draw the ideal and practical transfer characteristics of op-amp.
- d) State the conditions required for sustained oscillations in an oscillator.
- e) State two merits of active filters over passive filters.
- f) List two applications of current to voltage converter.
- g) Write the function of: i) IC 555 ii) IC 565

Q.2 Attempt any THREE of the following:**12**

- a) Compare class A, class B, class AB and class C power amplifiers on the basis of: i) Conduction angle ii) Efficiency iii) Q-point location iv) Applications
- b) Draw the circuit of op-amp differentiator. Derive the expression for output voltage and draw its waveforms.
- c) Explain Wien bridge oscillator using op-amp. Calculate its frequency of oscillation for $R = 10 \text{ k}\Omega$ and $C = 0.01 \text{ }\mu\text{F}$.
- d) Draw the block diagram of op-amp. Write the function of each block.

Q.3 Attempt any THREE of the following:**12**

- a) Write ideal and practical values of any four parameters of op-amp.
- b) If $R_1 = 2.2 \text{ k}\Omega$, $R_F = 22 \text{ k}\Omega$, $V_{CC} = \pm 15 \text{ V}$ and $V_{in} = 0.8 \text{ V rms}$, calculate the output voltage in inverting and non-inverting mode. Draw the circuits.
- c) Draw and explain the circuit of band pass filter. Draw its frequency response.
- d) A class A power amplifier delivers 3 W of AC output power with 25 % efficiency. Calculate the DC power drawn from the supply and the power dissipated. Draw the circuit of class A power amplifier.

Q.4 Attempt any THREE of the following:**12**

- a) Draw and explain inverting zero crossing detector with neat circuit and waveforms.
- b) Design an astable multivibrator using IC 555 for frequency 500 Hz and duty cycle 70 %. Draw the designed circuit. (Assume $C = 0.1 \mu\text{F}$)
- c) Design RC phase shift oscillator using IC 741 for $f_o = 2 \text{ kHz}$. Draw the designed circuit. (Assume $C = 0.01 \mu\text{F}$)
- d) Draw the circuit diagram of first order high pass filter. Give the expressions for cut-off frequency and pass band gain.
- e) Draw the block diagram of feedback amplifier and derive the expression for gain with negative feedback.

Q.5 Attempt any TWO of the following:**12**

- a) Draw the class B push-pull amplifier, explain crossover distortion and describe how class AB operation eliminates it, with waveforms.
- b) Draw an inverting summing amplifier with three inputs and derive its output voltage. Calculate V_o if $V_1 = 1 \text{ V}$, $V_2 = 2 \text{ V}$, $V_3 = -0.5 \text{ V}$ and all resistors are $10 \text{ k}\Omega$.
- c) Comment on the effect of negative feedback on gain, input resistance and output resistance of amplifiers. Explain the gain-bandwidth product and its importance.

Q.6 Attempt any TWO of the following:**12**

- a) Design a second order Butterworth high pass filter with lower cut-off frequency 1 kHz . Draw the designed circuit and its frequency response. (Assume $C = 0.01 \mu\text{F}$)
- b) Draw the block diagram of PLL and explain its operation. Define lock range and capture range.
- c) Explain Colpitts oscillator using op-amp and derive its frequency of oscillation. Calculate f_o for $L = 1 \text{ mH}$, $C_1 = 0.01 \mu\text{F}$ and $C_2 = 0.1 \mu\text{F}$.

Note: This is a **model question paper prepared by Ananda Technologies** only for practice and exam preparation, based on the pattern of previous MSBTE question papers and the K-scheme syllabus. It is **not an official MSBTE paper**, and it does **not** mean that these questions will come in the exam. Answers follow standard textbook points; marks shown are indicative. Free for students — anandatechnologies.in