

Total No of Questions: [08]

SEAT NO. :

[Total No. of Pages : 02]

**S.E. 2012 (E&TC Engineering)
Integrated Circuits (204187)
(Semester - II)**

Time: 2 Hours

Max. Marks : 50

Instructions to the candidates:

- 1) *Neat diagrams and waveforms must be drawn wherever necessary.*
- 2) *Figures to the right side indicate full marks.*
- 3) *Use of Calculator is allowed.*
- 4) *Assume Suitable data if necessary.*

- Q1) a) State any four characteristics of an ideal OPAMP? [02]
- b) A dual input, balanced-output (DIBO) differential amplifier has following specifications: $R_{C1} = R_{C2} = 2.2 \text{ K}\Omega$, $R_E = 4.7 \text{ K}\Omega$, $R_{in1} = R_{in2} = 50 \Omega$, $+V_{CC} = 10\text{V}$, $-V_{EE} = -10 \text{ V}$, $\beta_{dc} = \beta_{ac} = 100$ and $V_{BE} = 0.715\text{V}$. Calculate [04]
- i) I_{CQ}
 - ii) V_{CEQ}
 - iii) Voltage gain: A_d
- c) Why frequency compensation is required in OPAMP? Explain dominant pole compensation with circuit & frequency response. [06]
- OR**
- Q2) a) Give the classification of ICs according to number of components per chip? [02]
- b) An inverting amplifier using IC741 OPAMP has flat frequency response up to 40 KHz, voltage gain of 10. Find maximum peak – to peak input voltage to get maximum distortion less output? [04]
- c) Why level shifter / translator is needed in an OPAMP? What are its different types? Explain level shifter with constant current bias using diodes. [06]
- Q3) a) Draw an inverting summing amplifier with three inputs? Derive an expression for its output voltage $V_o = - (V_a + V_b + V_c)$. [06]
- b) Draw half wave precision rectifier & explain its operation in brief ? [03]
- c) Draw an inverting comparator using OPAMP with +ve reference & explain its operation in brief with waveforms? [03]
- OR**
- Q4) a) For an inverting Schmitt trigger $R_1 = 100\Omega$, $R_2 = 56\text{K}\Omega$ (where R_2 is connected in feedback path) . If $V_{in} = 1\text{V}_{(P-P)}$ sine wave and $V_S = \pm 15\text{V}$, calculate: [02]
- i) V_{UT} & V_{LT}
- b) Draw & explain in brief an instrumentation amplifier interfaced with RTD bridge for temperature measurement. [06]
- c) Draw & explain in brief a sample & hold circuit with waveforms? [04]

- Q5) a) In a V-I converter with grounded load, $V_{in} = 5V$, $R = 10K\Omega$ and voltage at noninverting terminal is 1V. Assuming that OPAMP is initially nulled, Calculate: **[04]**
 i) Load current
 ii) The output voltage V_o
- b) Draw a 2-bit D/A converter with R-2R resistors & explain its operation? State its advantages? **[05]**
- c) Explain various specifications of A/D converter. **[04]**
- OR**
- Q6) a) Draw an I-V converter and derive an expression for its output voltage (V_o)? **[04]**
 b) Draw & explain 2-bit flash type analog to digital converter (ADC) **[05]**
 c) An 8-bit D / A converter has a resolution of 10 mV / bit. Find the analog output voltage for the following digital inputs: **[04]**
 i) 10001010
 ii) 00010000
- Q7) a) Draw the block schematic of PLL and explain each block in detail. **[07]**
 b) Design an adjustable voltage regulator using LM317 for following specifications: **[04]**
 Output voltage, $V_o = 5V$ to 12V
 Output current, $I_o = 1A$ and $R_1 = 240\Omega$ (R_1 is connected between o/p terminal & adj terminal).
 c) Explain the following terms: **[02]**
 i) Load regulation
 ii) Line regulation
- OR**
- Q8) a) For a PLL 565, the free running frequency is 2.5KHz, $+V_{cc} = +10V$, $-V_{EE} = -10V$. If demodulation capacitor (C_2) is $10\mu F$, find lock range & capture range. **[04]**
 b) State applications of PLL? Also draw block diagram of FSK demodulator. **[05]**
 c) Draw & explain a three terminal voltage regulator with current boosting. **[04]**