Roll No. | | | | | | | | | | |

B.E (FT) END SEMESTER EXAMINATIONS – APRIL / MAY 2019

ELECTRONICS AND COMMUNICATION ENGINEERING

(Common to Bio-Medical Engineering)

4th Semester

EC8452 OPERATIONAL AMPLIFIERS AND ANALOG INTEGRATED CIRCUITS

(Regulation 2012)

Time: 3 Hours | Answer ALL Questions | Max. Marks 100

PART-A (10 x 2 = 20 Marks)

1. An non-inverting amplifier with a gain of 100 is nulled at 25°C. What will happen to the output voltage if the temperature rises to 50°C for an offset voltage drift of 0.15mV/°C?
2. Find the maximum frequency for a sine wave output voltage of 10V peak with an OPAMP whose slew rate is 1V/μs.
3. Design a Schmitt trigger circuit with the following parameters: UTP = LTP =1V, Vcc=±15V.
4. What is meant by a "precision diode" and mention its application?
5. Draw the pin configuration of IC 565.
6. Define voltage to frequency conversion factor.
7. Draw the circuit diagram of a S/H circuit
8. A basic step of a 9-bit DAC is 10.3mV. If 000000000 represents 0V, what output is produced if the input is 101101111?
9. Mention the different types of noise.
10. State the limitations of a two terminal regulator IC.

PART-B (5 x 16 = 80 Marks)

11.(i) With neat diagram, derive the expression for Widlar Current source and also design a Widlar current source for generating a constant current $I_0 = 10\mu A$. Assume $V_{cc} = 10V$ and $V_{BE} = 0.7V$, $\beta = 125$, $V_T = 25mV$. (10)

(ii) Discuss in detail about the stability of an OPAMP. (6)

12.a)(i) Derive the output expression of the instrumentation amplifier with three OPAMPS. (10)

(ii) Draw an OPAMP circuit whose output is $5V_1 + 2V_2 - 5V_3 - 2V_4$. (6)

(OR)

12.b)(i) Derive and design a first order low pass filter with the frequency of 2KHz. Assume $C = 0.1\mu F$ and the gain A =2. (10)

(ii) For a non-inverting amplifier, $R_1 = 1K\Omega$ and $R_f = 10K\Omega$, calculate the maximum output offset voltage due to V_{os} and I_B. The OPAMP is LM307 with $V_{os} = 10mV$ and $I_B = 300nA$, $I_{os} = 50nA$. Calculate the value of R_{comp} to reduce the effect of I_B. Calculate the maximum output offset voltage with R_{comp}. (6)

(P.T.O)

13.a)(i) Construct the four quadrant transconductance multiplier and derive its output expression. (10)

(ii) With a neat diagram, explain how a frequency synthesizer circuit using PLL IC 565. (6)

(OR)

13.b)(i) Explain the operation of VCO with neat block diagram and derive its frequency of oscillation. (10)

(ii) Calculate the output frequency f_o, lock range Δf_L and capture range Δf_c of a 565 PLL if $R_T = 6.8k\Omega$, $C_T = 0.001\mu F$ and $C = 1\mu F$. (6)

14.a)(i) A 8-bit A/D converter accepts an input voltage signal of range 0V to 9V. What is the minimum value of the input voltage required for generating a change of one least significant bit?. Specify the digital output for an input voltage of 4V. What input voltage will generate all 1s at the A/D converter output? (8)

(ii) Explain in detail about the operational features of 4-bit weighted resistor type D/A converter. (8)

(OR)

14.b)(i) With neat diagram and necessary waveforms, explain the working of voltage to time converter. (8)

(ii) Briefly explain the operation of digital switches used for DAC. (8)

15.a)(i) Briefly explain the working principle and functionalities of LM 380 audio amplifier. (10)

(ii) Describe in detail the working of an optocoupler. (6)

(OR)

15.b) With neat functional diagram, explain the working of 555 timer as monostable multivibrator and also derive an expression for the frequency of oscillation with relevant waveforms. (16)
