

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-IV (NEW) EXAMINATION – WINTER 2018****Subject Code:2141002****Date:22/11/2018****Subject Name:Analog Circuit Design****Time: 02:30 PM TO 05:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) State the functions of the transistors connected to the reset and discharge pins of IC 555. **03**
- (b) What is the role of the inter electrode capacitances C_{bc} , C_{be} and C_{ce} in a hybrid Π model? Why C_{ce} does not figure in the model? **04**
- (c) Define the following for an Op Amp: **07**
 [1] Input Resistance [2] Slew Rate [3] Balanced output [4] PSRR
 [5] Voltage Gain [6] Offset Voltage [7] Unity Gain Bandwidth
- Q.2** (a) A bipolar junction transistor has $h_{ie}=1\text{ K}\Omega$, $h_{fe}=100$; h_{re} , h_{oe} are negligible. $C_c=3\text{pF}$ and the collector current is 10mA . The short circuit current gain is 10 at a frequency of 10 M Hz . Calculate the values of f_{α} , f_{β} and f_{γ} . **03**
- (b) List all the resistances and their typical values in a hybrid Π model **04**
- (c) Draw the hybrid Π model for a single stage CE transistor amplifier having load resistance R_L and obtain the expression for short circuit current gain. **07**
- OR**
- (c) Draw the hybrid Π model for a transistor in CE configuration and derive the expression for transconductance g_m . Justify the validity of this model. **07**
- Q.3** (a) Perform DC analysis of a Dual Input Balanced Output Differential Amplifier **03**
- (b) For a given operational amplifier, the input voltages are $150\ \mu\text{V}$ and $140\ \mu\text{V}$ DC. This amplifier has a differential gain of 4000 and a CMRR of 100. Evaluate its output voltage. What change would occur in its output voltage if the CMRR changes to a new value of 1,00,000 ? **04**
- (c) Define CMRR. Discuss the effect of R_E on CMRR. How can a constant current source and a current mirror circuit help to improve this value? **07**
- OR**
- Q.3** (a) For a dual input balanced output, it is given that $V_{CC}=\pm 12\text{V}$, $R_C=4.7\text{ K}\Omega$, $R_B=100\Omega$ and $R_E=2.7\text{ K}\Omega$. Evaluate its Quiescent point of operation. **03**
- (b) What is the significance of Slew Rate? How does it affect the performance of an Op Amp? **04**
- (c) Explain the working of an adder and a Subtractor circuit to perform the mathematical operation $V_O=V_1+V_2$ and $V_O=V_1-V_2$ respectively. **07**
- Q.4** (a) What are precision rectifiers? Explain the working of anyone of them. **03**
- (b) How does the working of an operational amplifier differ in inverting and noninverting configurations? **04**
- (c) Discuss op amp based triangular waveform generator circuits. Obtain the expression for the same. **07**

OR

- Q.4** (a) For IC 555, explain the functions of the following pins: **03**
[1] Trigger [2] Threshold [3] Control
- (b) What is thermal drift and error voltage? Suggest methods to reduce the same. **04**
- (c) Explain the compensation of input offset voltage with a neat diagram. **07**
- Q.5** (a) Draw the block diagram of PLL and explain each block. **03**
- (b) Discuss the features of LM317 Regulator. **04**
- (c) Derive expression of frequency of oscillation of an RC phase shift oscillator. **07**
- OR**
- Q.5** (a) Derive the expression for filter transfer function of a first order low pass filter and draw its frequency response characteristics. **03**
- (b) Discuss any one application of a PLL in modulation signal detection. **04**
- (c) Derive expression of frequency of oscillation of a Wein Bridge oscillator. **07**
