Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

III SEMESTER B.TECH (BME) DEGREE MAKE UP EXAMINATIONS DECEMBER 2017
SUBJECT: ANALOG ELECTRONICS (BME 2102)
(REVISED CREDIT SYSTEM)
Dec 20th Wednesday, 2017, 9 AM to 12 NOON

TIME: 3 HOURS **MAX. MARKS: 100**

Instructions to Candidates:

1. **Answer FIVE full questions.**
2. **Draw labeled diagram wherever necessary**

1. (a) The amplifier circuit with voltage divider bias, is designed in such a way as to have an operating point of 6V, 1 mA. If the transistor has β =150, find $R_E, R_C, R_1 \& R_2$. Assume $V_{BE} = 0.7V$, $V_E = 10\%$ *of* V_{CC} and $V_{CC} = 16V$. 8

(b) Derive an expression for the factor that describes the stabilization of collector current against variations in the value of V_{BE}, keeping the values of I_{CO} and β constant. 6

(c) What do you understand by transistor biasing? What is its need? Mention various methods of biasing stating their advantages and disadvantages. How stabilization of operating point is achieved by fixed bias method? 6

2. (a) A two stage RC-coupled amplifier uses a BJT with $R_E = 2K\Omega$, $R_C = 2.5K\Omega$, $R_1 = 20\,\text{K}\Omega$ and $R_2 = 10\,\text{K}\Omega$. Find mid band amplification in dB's and overall lower 3-dB frequency. The h parameter values are: $h_{ie} = 1K\Omega$ and $h_{fe} = 100$. Find the value of C_b necessary to give a lower 3-dB frequency of 20 Hz. 8

(b) Draw the basic amplifier circuit and derive the general formula for the following parameters: (i) Input impedance (ii) current gain (iii) output impedance and (iv) voltage gain in terms of h parameters and the load. 6

(c) With an approximate model of common emitter transistor amplifier circuit with emitter resistance, derive expressions for current gain and voltage gain. 6

3. (a) A germanium bipolar junction transistor has $h_{ie} = 6K\Omega$ and $h_{fe} = 224$ at $I_C = 1mA$ with $f_T = 80MHz$ and $C_{b'c} = 12\,pF$. Determine g_m, $r_{bb'}$, $r_{b'e}$ and $C_{b'e}$ at room temperature. 8

(b) How does negative feedback effect the input and the output impedance of a general voltage amplifier circuit? Explain in mathematical terms. 6

(c) Design a voltage series feedback amplifier circuit with the following specifications: Input resistance with feedback 40 KΩ. The following specifications are provided: $BC107, h_{fe} = 200, h_{ie} = 1K, V_{CE} = 5v \,\&\, I_C = 2mA.$ 6

4. (a) What are the limitations of LC and RC oscillators? How different is crystal oscillator in comparison with LC and RC oscillators? Highlight the principle, equivalent circuit, symbol and frequency response of the crystal, together with its working. 8

(b) How does Class AB configuration help in reducing crossover distortion originating in class B power amplifier? Justify the same with suitable circuit and characteristics. Mention its advantages and disadvantages. 6

(c) Design a Wien bridge oscillator circuit that generates oscillations at a frequency of 5 KHz. $BFW10$ with $V_{DD} = 24V, V_{DS} = 10v, I_D = 2mA, R_g = 1\,M\Omega, r_d = 40\,K\Omega,$ $g_m = 2.5mA/V and$ $A \geq 3.$ 6

5. (a) A common source amplifier circuit has the following circuit components. $R_D = 8k\Omega, R_G = 1M\Omega, V_{DD} = 24V,$ $R_S = 2.k\Omega, I_{DSS} = 6mA \,\&\, V_P = -6V.$ Determine the operating point, V_D, ac equivalent circuit, input impedance and output impedance. 8

(b) Analyze a common drain amplifier circuit to obtain expressions for its voltage gain and current gain. What is the effect of load resistance on its voltage gain? 6

(c) i) How different is MOSFET with respect to JFET taking into consideration their output and transfer characteristics? Explain. 4+2

ii) Highlight important features of large signal class B power amplifier.