INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Four Year B.Tech III Semester End Examinations(Regular) - November, 2019

Regulation: IARE – R18

ANALOG ELECTRONICS

Time: 3 Hours   (EEE)   Max Marks: 70

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) Obtain the expressions for DC voltage, RMS voltage, ripple factor and rectification efficiency of half wave rectifier. **[7M]**

   (b) For a diode current of 1mA at room temperature a germanium diode requires forward bias of 0.1435 V and silicon diode requires forward bias of 0.718 V. Find the ratio of reverse saturation current in germanium diode to that in silicon diode? **[7M]**

2. (a) Analyze CE amplifier using simplified hybrid CE model and obtain all the characteristic parameters. **[7M]**

   (b) Consider a single stage CE amplifier with $R_S = 1K\Omega$, $R_E = 500\Omega, R_C = 1K\Omega$, $R_L = 1.2K\Omega$, $h_{fe} = 50\,and\,h_{ie} = 1.1K\Omega$, $h_{oe} = 2\,X\,10^{-6}$ mhos, h_{re}=0. Calculate current gain, input impedance and voltage gain? **[7M]**

UNIT – II

3. (a) Explain the principle of common drain FET amplifier with the help of circuit diagram. Derive the expressions for input impedance, output impedance and AV. **[7M]**

   (b) A common drain FET amplifier circuit has the following circuit parameters: R_S=4kΩ, R_G=10MΩ, μ=50 and $r_d = 35$KΩ. Determine A_V and Z_i and Z_o. **[7M]**

4. (a) With neat diagram, explain the construction and working principle of N-channel depletion type MOSFET. **[7M]**

   (b) A common source FET amplifier circuit with un bypassed Rs has the following circuit parameters: $R_d = 15$K, $R_S = 0.5$KΩ, $R_g = 1$M, $r_d = 5$K, g_m= 5mS and $V_{DD} = 20$ V. Determine A_V & R_O. **[7M]**

UNIT – III

5. (a) Discuss the frequency response characteristics of RC coupled amplifiers. Obtain general expression for gain at a low and high frequencies **[7M]**

   (b) A single transistor is acting as ideal Class B amplifier with load of 1KΩ, if DC collector current is 15mA, V_{CC}=20V. Determine its efficiency. **[7M]**

6. (a) Explain the operation of complementary symmetry push pull amplifier. **[7M]**

    (b) Define power amplifier and explain different types of power amplifiers. **[7M]**

UNIT – IV

7. (a) Discuss with mathematical expressions, how the negative feedback in amplifiers increases bandwidth and reduces distortions in amplifiers. **[7M]**

    (b) A Hartley oscillator is designed with L $= 20\mu$H and a variable capacitance. Find the range of capacitance values if the frequency of oscillation is varied between 950 KHz to 2050 KHz. **[7M]**

8. (a) Draw the circuit and explain the principle of operation of RC phase shift oscillator circuit. Derive the expression for the frequency of oscillations. **[7M]**

    (b) Find the frequency of oscillations of a Wein bridge oscillator with R=20KΩ and C=1000pF. **[7M]**

UNIT – V

9. (a) Explain the terms i) PSRR ii) CMRR iii) Slew rate iv) Input bias current **[7M]**

    (b) An inverting amplifier using 741C must have a flat response upto 40KHz. The gain of the amplifier is 10.What maximum peak to peak input signal can be applied without distorting the output? Note: The 741C has typical slew rate of 0.5V/μs. **[7M]**

10. (a) Explain the characteristics of an ideal operational amplifier. Draw the equivalent circuit and open loop circuit of an Ideal Op-amp. **[7M]**

    (b) In circuit shown below $R_1 = 10K\Omega$, $R_f = 100K\Omega$, $v_i = 1V$. A load of $25K\Omega$ is connected to the output terminal. Calculate

    i) i_1

    ii)v_o

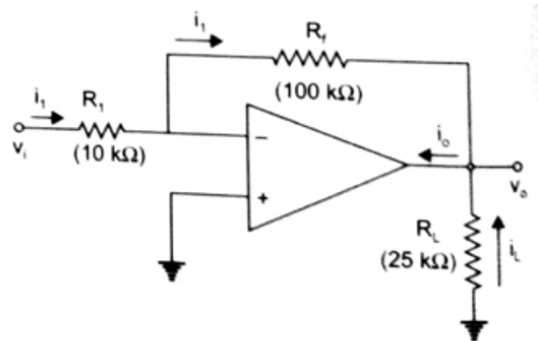   iii) i_l and total current i_o in to the output pin. **[7M]**

Figure 1