[Time: Three Hours]   **[Marks:80]**

Please check whether you have got the right question paper.

N.B: 1. Question.No.1 is compulsory.
        2. Attempt any three from remaining five questions.
        3. All question carry equal marks.
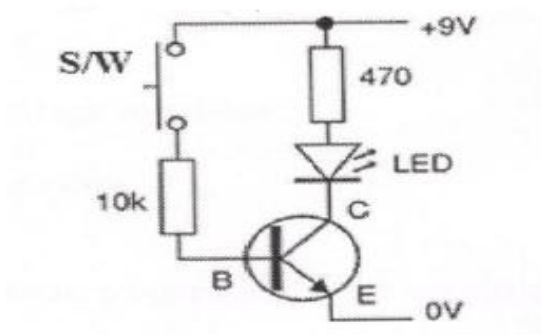   4. Assume suitable data wherever necessary.

Q.1 Attempt all   **20**

a) Calculate the CMRR (in dB) for the circuit measurements of $V_D = 1$ mV, $V_0 = 120$ mV, and $V_c = 1$ mV, $V_0 = 20$ uV.

b) Explain operation of following window comparator circuit.
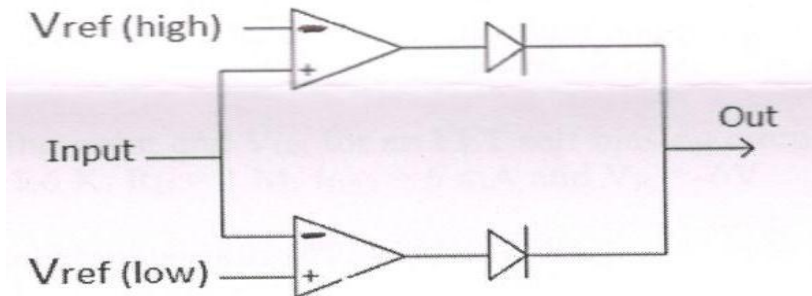

c) Explain operation of circuit for various position of switch (S/W).

d) Explain crossover distortion in class B power amplifier. How it is overcome.

e) Sketch the transfer curve for an FET with $I_{DSS} = 12$ mA and $V_p = -6$ V. Determine the value of I_D at $V_{GS} = -3V$ from the graph, and compare it to the value determined using Shockely's equation.

Q.2 a) Determine output voltage. Assume $V_B = 8v$ and input to be sine wave of 20 V peak. Draw   **08**
waveform considering ideal diodes.
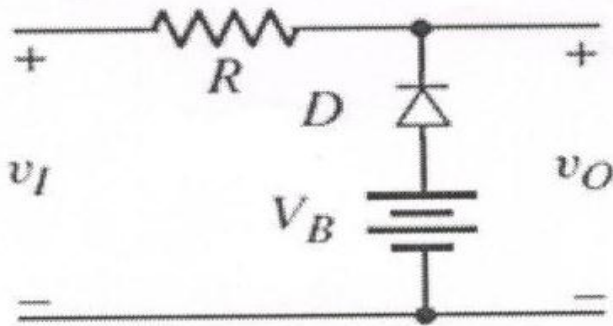
b) For the zener diode network, determine V_L, V_R, I_Z and P_Z **08**
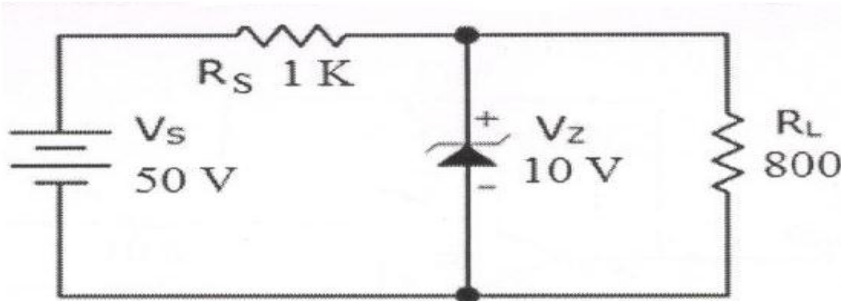
c) Compare BJT and FET.   **04**

Q.3 a) BJT transistor with emitter - stabilized bias circuit has following values,   **08**
$V_{CC} = 20V$, $R_B = 430K$, $R_c = 2K$, $R_E = 1k$, $\beta = 50$. Determine operating point and V_{BC}

b) Determine operating point and V_{DS} for an FET self biasing circuit with   **08**
$V_{DD} = 12V$, $R_D = 2.2K$, $R_S = 1.6K$, $R_G = 1M$, $I_{DSS} = 6mA$ and $V_P = -6V$

c) Explain working of D-MOSFET   **04**

Q.4 a) Derive the expression of stability factor for a voltage divider biasing bias circuit.   **08**

b) Draw and explain series voltage regulator.   **08**

    c) Explain total harmonic distortion.   **04**
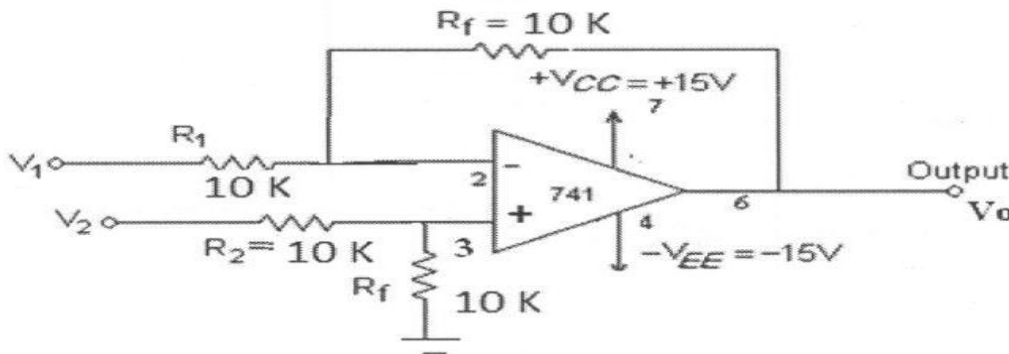
Q.5   a) Explain working of three opamp instrumentation amplifier. Derive again equation.   **08**

    b) Explain RC Phase shift oscillator.   **08**
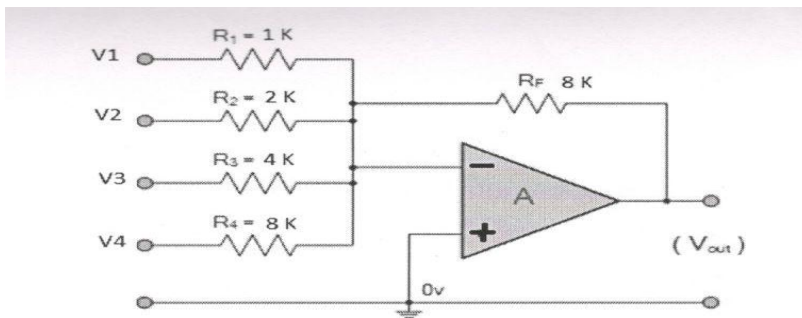
    c) Give typical values for OpAmp IC 741.   **04**
       1) gain Bandwidth Product
       2) Output impedance
       3) Slew rate
       4) CMRR.

Q.6   a) Derive expression for output voltage and hence determine the output voltage consider $V_1 = V_2 = 2V$.   **05**
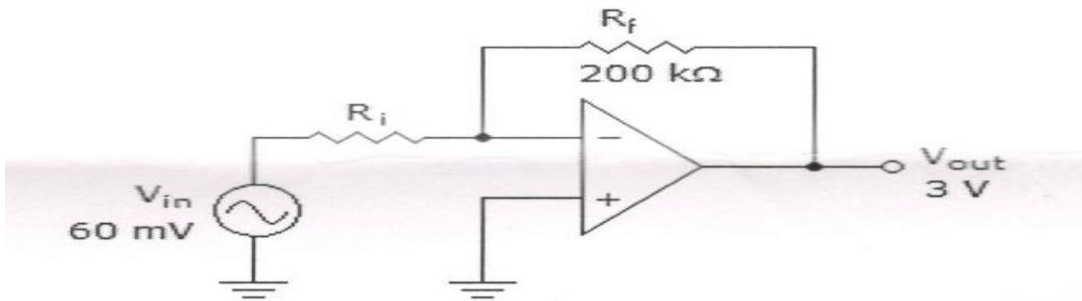

    b) Derive the expression for output voltage for the following OpAmp circuit. Determine output voltage if $R_1 = 1K, R_2 = 2K, R_3 = 4K, R_4 = 8K, R_f = 8K, V_1 = 1\,V, V_2 = 0V, V_3 = 1V\ and\ V_4 = 1V$.   **05**

c) Identify the circuit diagram. Derive the expression for output voltage. Consider $R_f =$ 05
$200K, V_{IN} = 60mV, V_0 = 3V$. What value of input resistance is needed is needed in the given
circuit to produce the given output voltage?

d) Identify the circuit diagram. Derive the expression for output for voltage. 05