Reg. No.											

MANIPAL INSTITUTE OF TECHNOLOGY

(A constituent unit of MAHE, Manipal 576104)

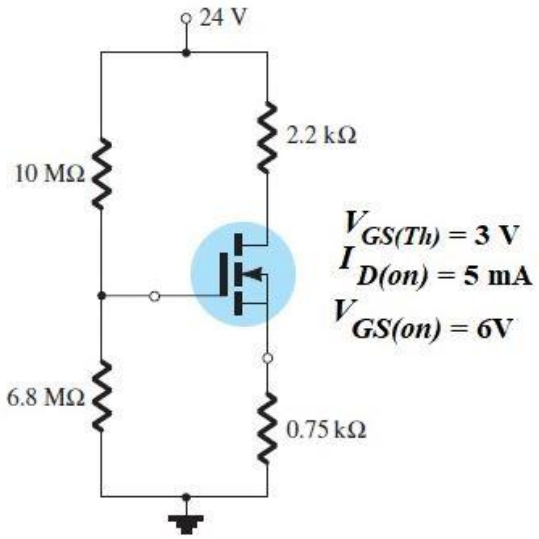
III SEM B. Tech (BME) DEGREE END SEMESTER EXAMINATIONS, MARCH-2021.
SUBJECT: ANALOG ELECTRONICS (BME 2151)
(REVISED CREDIT SYSTEM)
Monday, 1st March, 2021; 9:00 A.M to 12:00 NOON

TIME: 3 HOURS **MAX. MARKS: 50**

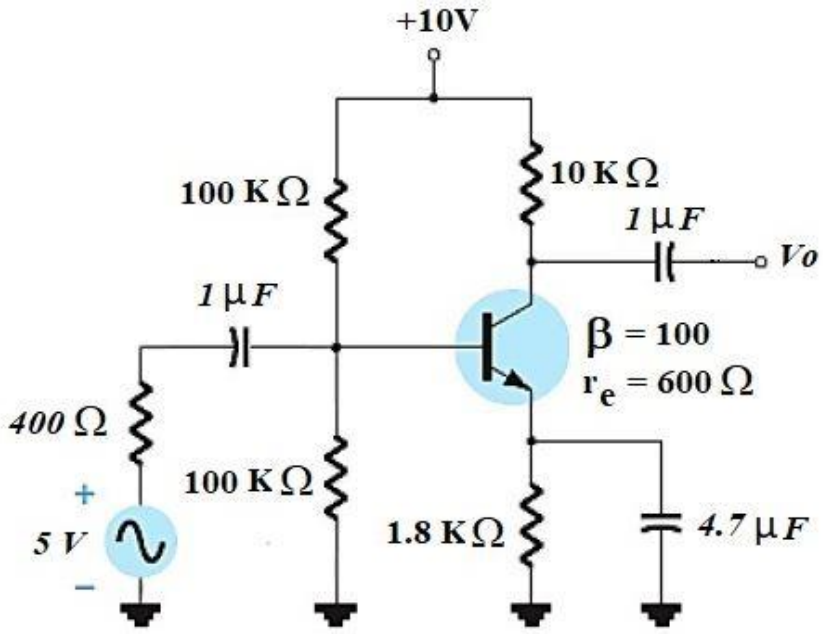
Instructions to Candidates:

1. Answer ALL questions
2. Missing data may be suitably assumed

1. (A) For the following circuit, graphically determine I_{DQ} and V_{GSQ}, and determine the voltages V_D, and V_S. 5



(B) Determine the lower cut-off frequency of the following amplifier circuit. 3



(C) Is it possible to relate α_{dc} and β_{dc} of a BJT? Justify your answer. 2

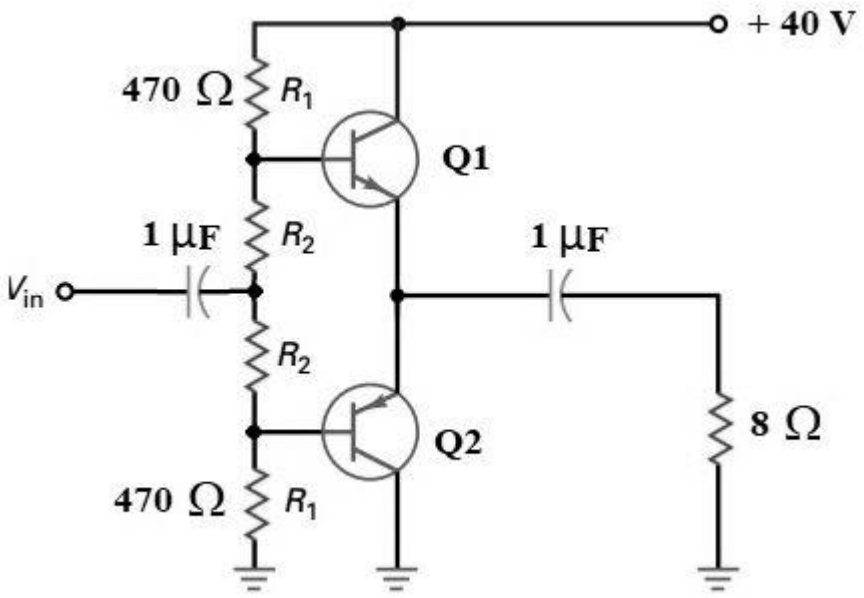
2. (A) Assuming V_{BE} = 0.75V, analyse the following amplifier circuit and determine: 5

(i) The value of resistors "R_2" required to produce distortion-free output

(ii) Trickle current that eliminates the distortion

(iii) Maximum a.c output power, and

(iv) Minimum power rating of the transistors



(B) For the emitter degenerative biasing circuit of a BJT, employing a voltage divider network, prove that the stability factor is $(1+\beta)\dfrac{1+\dfrac{R_B}{R_E}}{1+\beta+\dfrac{R_B}{R_E}}$ 3

(C) With an appropriate example illustrate that a bipolar junction transistor can be used as an amplifier. 2

3. (A) For an emitter-follower circuit employing NPN transistor in fixed bias configuration, prove that: 5

(i) $Zi = R_B \parallel \beta(r_e + R_E)$

(ii) $Z_O = r_e \parallel R_E$

(iii) $A_V = 1$

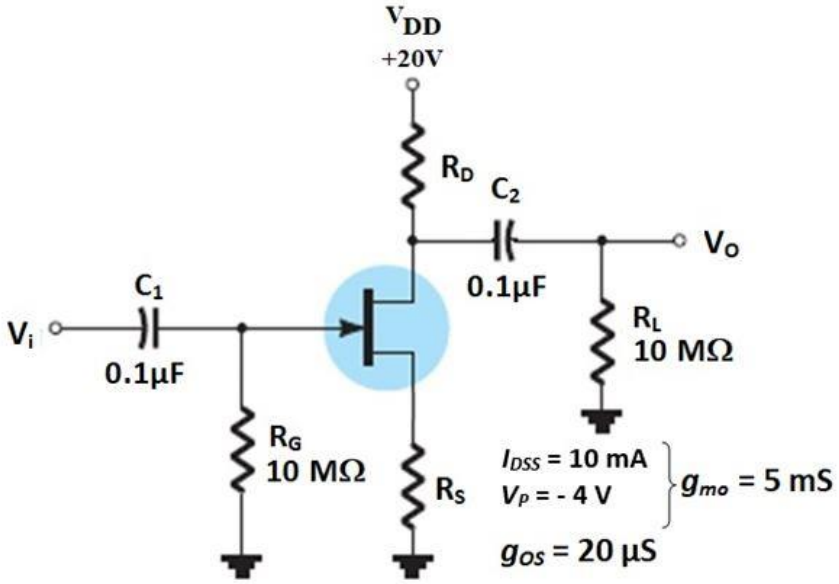
(B) In an RC phase shift oscillator if $C_1 = C_2 = C_3 = 200$ pF. 3

(i) Choose resistors required to produce sustained oscillations of frequency 4KHz

(ii) Select appropriate valued collector resistor (R_C) if emitter resistor is 120 Ω

(C) What causes cross-over distortion in a Class–B power amplifier? How do you eliminate such distortion? Explain. 2

4. (A) For the circuit shown below, choose value of R_D and R_S so as to establish a gain of 10 using a relatively high level of trans-conductance defined at $V_{GSQ} = ¼ V_P$. Also test if the solution holds good or not? 5



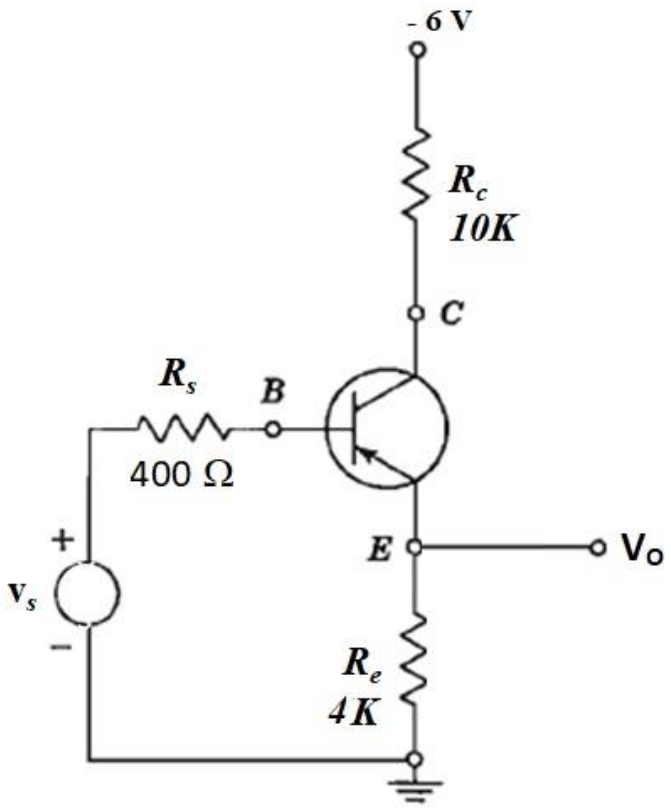
(B) Considering the feedback, analyse the following circuit for: 3

(i) Voltage gain

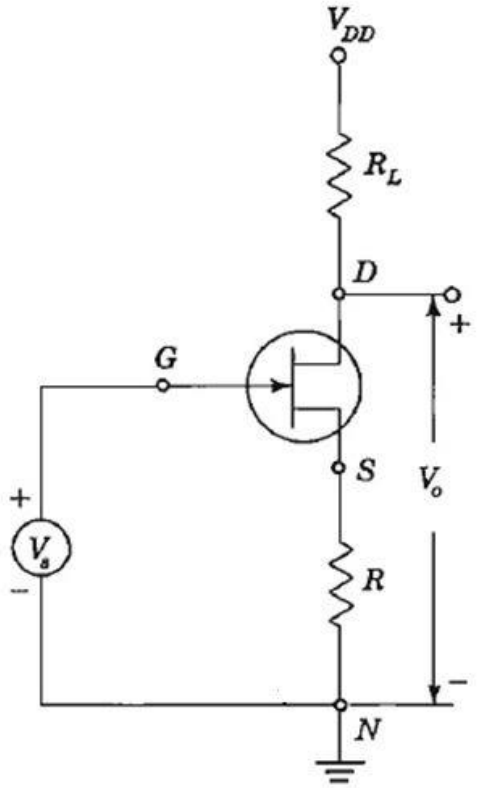
(ii) Input resistance

(iii) Output resistance

Assume : h_{fe} = 50, h_{ie} = 1 KΩ, and $h_{re} = h_{oe} = 0$



(C) Identify the feedback topology and draw a labelled a.c equivalent circuit of the following amplifier circuit. 2



5. (A) How does an UJT relaxation oscillator produces saw-tooth waveform, and how do you determine the frequency of oscillations? Explain. 5

(B) Draw the circuit diagram of BJT current-series feedback amplifier, and find out its de-sensitivity and input impedance. 3

(C) How does the negative feedback affect the input and output impedances in voltage-series and current-shunt configurations? 2