University of Mumbai

Examinations Summer 2022

Program: Electronics and Telecommunication Engineering

Curriculum Scheme: Rev2019

Examination: SE Semester III

Course Code: ECC302 and Course Name: Electronic Devices and Circuits

Time: 2 hour 30 minutes Max. Marks: 80

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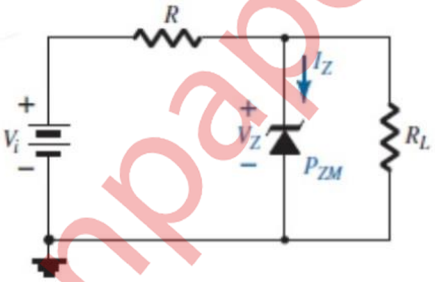
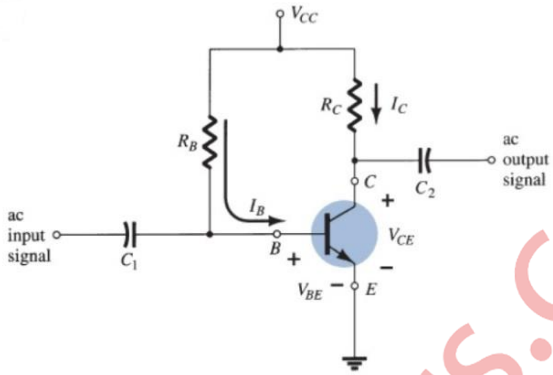
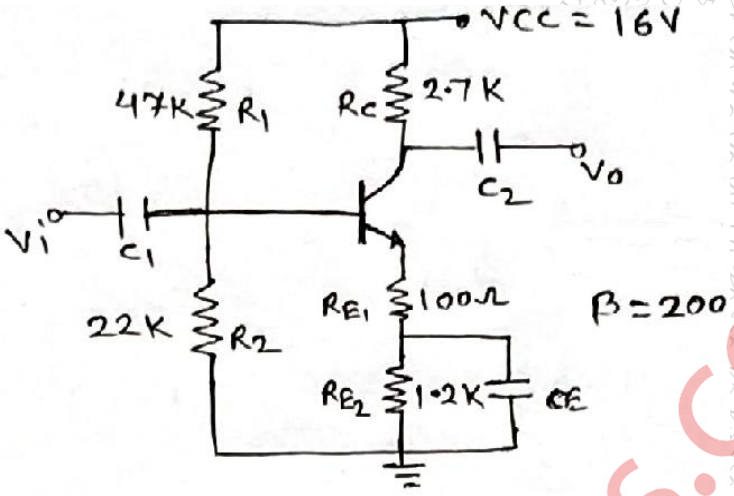
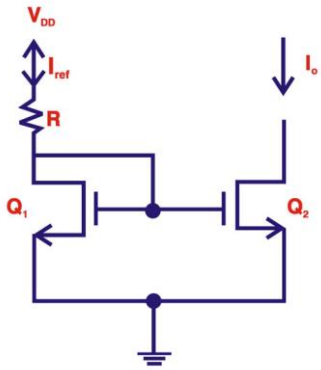
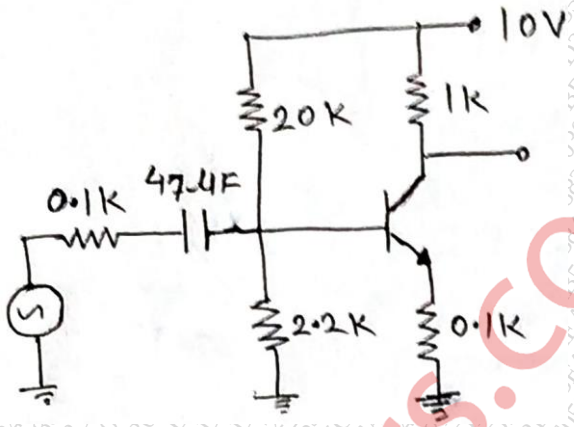
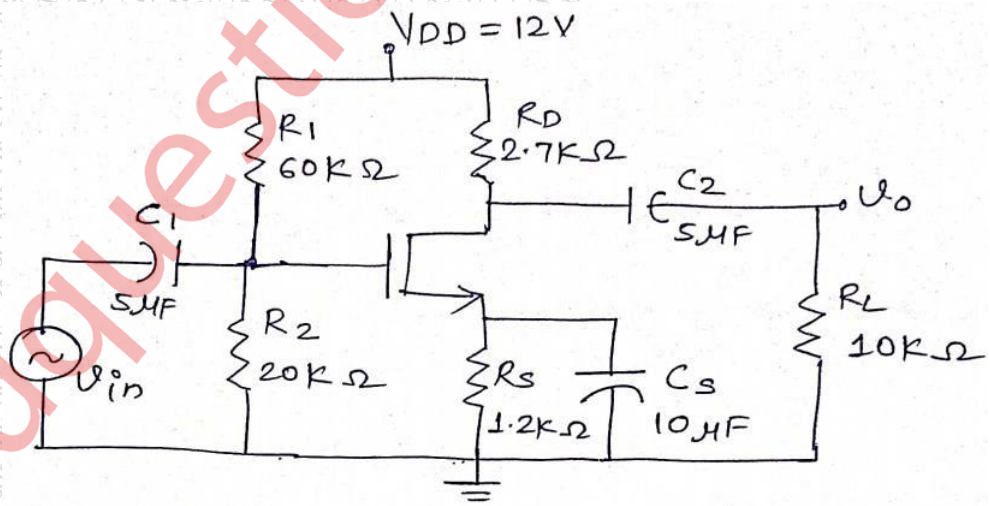
Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	The reverse saturation current of a transistor increases with the increase of temperature at the rate of:
Option A:	doubles in value for every 1°C increase in temperature
Option B:	doubles in value for every 25°C increase in temperature
Option C:	doubles in value for every 10°C increase in temperature
Option D:	quadruples in value for every 100°C increase in temperature
2.	Calculate the voltage across R_L. V_i = 9 V, V_Z = 3 V, R=6.8 KOhms, R_L=2.2 KOhms 
Option A:	3 V
Option B:	2.2 V
Option C:	9 V
Option D:	4.4 V
3.	For a JFET self bias circuit, if the source resistance is increased keeping all other parameters constant, what is the effect on the operating point?
Option A:	Can't change Source resistance
Option B:	Remains same
Option C:	It moves towards ID = IDSS, VGS = 0
Option D:	It moves towards ID = 0, VGS = VP
4.	Adding a Resistor between emitter of BJT and Ground terminal of a CE BJT amplifier _____
Option A:	Decreases the stability of the amplifier
Option B:	Improves the stability of the amplifier
Option C:	Increases the Gain of the amplifier
Option D:	Has no effect
5.	To operate as an amplifier, BJT and MOSFET should operate in _____& _____ regions respectively
Option A:	Active and Saturation

Option B:	Saturation and linear
Option C:	Cutoff and Linear
Option D:	Saturation and Cutoff
6.	For the fixed bias circuit shown, calculate the small signal input impedance, Zi in Ohms. Beta=120. R_B=240KΩ, R_C=1.2KΩ, V_CC = 12 V, V_BE = 0.7 V, 
Option A:	1.2 KOhm
Option B:	240 Kohm
Option C:	551 ohm
Option D:	1 KOhm
7.	High cutoff frequency of an amplifier depends on
Option A:	Output Coupling capacitor
Option B:	bypass capacitor
Option C:	Input Coupling capacitor
Option D:	Parasitic capacitor
8.	For a direct coupled amplifier, if f_H = 200 KHz then calculate the bandwidth of the amplifier.
Option A:	1 KHz
Option B:	100 KHz
Option C:	200 KHz
Option D:	400 KHz
9.	If output is measured between two collectors of transistors, then the Differential amplifier with two input signal is said to be configured as
Option A:	Dual Input Balanced Output
Option B:	Dual Input Unbalanced Output
Option C:	Single Input Balanced Output
Option D:	Single Input Unbalanced Output
10.	Power amplifier directly amplifies _____
Option A:	Voltage of signal but not Current
Option B:	Current of the signal but not Voltage
Option C:	Power of the signal but not Voltage and Current
Option D:	Voltage, Current and Power of the signal

Q2.	Solve any Two Questions out of Three 10 marks each
A	Determine the following for the network given below Fig. 1 Voltage gain, Current gain, input impedance and output impedance  Fig. 1
B	With neat diagram derive the efficiency of transformer coupled class –A power amplifier? State its uses.
C	Explain construction and working of n-channel E-MOSFET with output characteristics

Q3	
A	**Solve any Two** **5 marks each**
i.	For a Class B amplifier providing an 18 V peak signal to a 20 Ω load (Speaker) and a power supply of VCC = 20 V, determine the output power, input power and efficiency.
ii.	Why should be Rc as large as possible in design of CE amplifier?
iii.	Explain Zener diode as a voltage regulator.
B	**Solve any One** **10 marks each**
i.	Let V_{DD} = 5V, $V_{TH,1}$ = 1V, $k_{n,1}'$ = 20μA/V^2 and R = 1KΩ. What should be $(W/L)_1$ needed for creating I_{ref} = 1mA? What should be $(W/L)_2$ if we want I_o = 7mA, 10 mA and 15 mA? Refer Fig. 2  Fig. 2

ii.	For the circuit shown in Fig. 3, the transistor parameter are V_{BE} (on) = 0.7 V, β = 200, VA = ∞, i. Derive the expression for lower cutoff frequency due to input coupling capacitor. ii. Determine lower cut-off frequency and voltage gain  Fig.3

Q4	Solve any Two	10 marks each
A	Explain the operation of a Differential amplifier for common mode signals and differential input signals. Also explain CMRR.	
B	Determine f_L, f_H, f_T.  Given: $K_n' = \mu_n C_{ox} = 100\,\mu A/V^2$, $V_{Tn} = 0.5\,V$ $W = 1.8\,\mu m$, $L = 180\,nm$, $\gamma_d = \infty$ $C_{gd} = 2$ pF, $C_{gs} = 4$ pF, $C_{ds} = 0.5$ pF, $C_{W_i} = 5$ pF, $C_{W_o} = 6$ pF	

C	Design a voltage divider bias circuit operating at (V_{CEQ} = *12 V*, I_{CQ} = *2 mA*) for S(I_{CO}) ≤ 5. Given: β = 100, V_{CC} = 20