GATE QUESTIONS

A.Y.: 2021-2022 (Odd SEM) Scheme: CBCGS-HME 2020

Class: S.E. E&TC Subject: Electronic Devices and Circuits

1 mark sample questions

1. For the same a.c. Voltage and Load impedance, which of the following statements about rectifier are correct?

a). The average load current in a full wave rectifier is twice than in half wave rectifier.

b). The average load current in a full wave rectifier is n times that the half wave rectifier.

c). Half wave rectifier will a bigger sized transformer compared to full wave rectifier.

d). Half wave rectifier will a small sized transformer compared to full wave rectifier.

2. A half wave rectifier uses a diode with a forward resistance R_f. The voltage is $V_m sin\omega t$ and the load resistance is R_L. The DC current is given by:

a). $\frac{V_m}{\sqrt{2}R_L}$

b). $\frac{V_m}{\pi(R_f+R_L)}$

c). $\frac{2V_m}{\sqrt{\pi}}$

d). $\frac{V_m}{R_L}$

3. For small signal ac operation, a practical forward biased diode can be modeled as:

a. Resistance and capacitance in series.

b. Ideal diode and resistance in parallel

c. Resistance and ideal diode in series

d. Resistance

4. If a transistor is operating with both of its junctions forward biased, but with the collector base forward bias greater than the emitter base forward bias, then it is operating in the :

a) Forward active mode

b) Reverse active mode

c) Reverse saturation mode

d) Forward saturation mode

5. A BJT is said to be operating in the saturation region, if:

a) Both the junction are reverse biased

b) Base emitter junction is in reverse biased, and base collector junction is forward biased

c) Base emitter junction is in forward biased, and base collector junction is reverse biased.

d)Both the junctions are forward biased.

6. If for a silicon NPN transistor, the base to emitter voltage (V_{BE}) is 0.7volts and collector to base voltage (V_{CB}) is 0.2 volts, then the transistor is operating in the

a) Normal active mode

b) Saturation mode

c) Inverse active mode

d) Cutoff mode

7. Choose the correct match for input resistance of various amplifier configurations shown below

Configuration CB: common base

CC: common collector

CE: common emitter Input resistance

LO: Low

MO: Moderate

HI: High

a) CB-LO, CC-MO, CE-HI

b) CB-LO, CC-HI, CE-MO

c) CB-MO, CC-HI, CE-LO

d) CB-HI, CC-LO, CE-MO

8. Channel current is reduced on application of a more positive voltage to the gate of a depletion mode n-channel MOSFET.

a) True
b) False

9. An n-channel JFET has a pinch-off voltage V_P = -5 V, V_{DS}(max) = 20 V and g_m = 2 mA/V. The minimum 'ON' resistance is achieved in the JEFT

a) V_{GS}=-7 and V_{DS}=0V
b) VGS=0 and V_{DS}=0V
c) V_{GS}=0 and V_{DS}=20V
d) V_{GS}=-7 and V_{DS}=20V

10. The transit time of the current carries through the channel of a JFET decides its _____ characteristic

a) Source

b) Drain

c) GATE

d)Source and drain

11. The cascode amplifier is a multistage configuration of

a) CC-CB

b) CE-CB

c) CB-CC

d) CE-CC

12. A cascode amplifier stage is equivalent to

a) A common emitter stage following by a common base stage

b) A common base stage followed by an emitter follower

c) An emitter follower stage followed by a common base stage

d) A common base stage followed by a common emitter stage

13. the unit of q / KT are

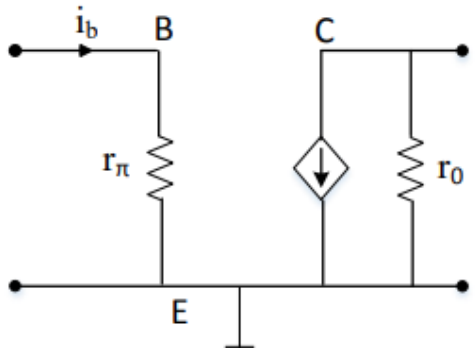
a) V

b) V -1

c) J

d) J / K

14. The current ib through base of a silicon npn transistor is 1+0.1 cos (1000πt) ma. At 300K, the rπ in the small signal model of the transistor is



a) 250Ω

b) 27.5Ω

c) 25Ω

d) 22.5Ω

15. A common emitter transistor amplifier has a collector current of 1.0 mA when it's a base current is 25 μ A at the room temperature. Its input resistance is approximately equal to…

16. The 'Pinch – off' voltage of a JFET is 5.0 volts. Its 'cut – off' voltage is

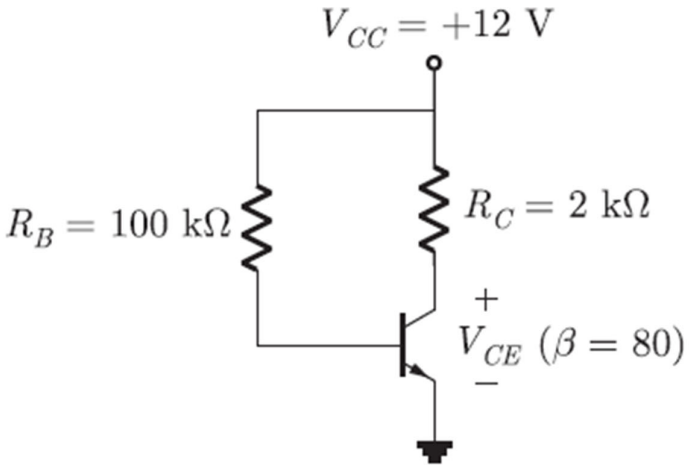
a) (5.0)1/2 V

b)2.5 V

c) 5.0 V

d) (5.0)3/2 V

17. The biasing circuit of a silicon transistor is shown below. If *b* = 80, then what is *VCE* for the transistor?



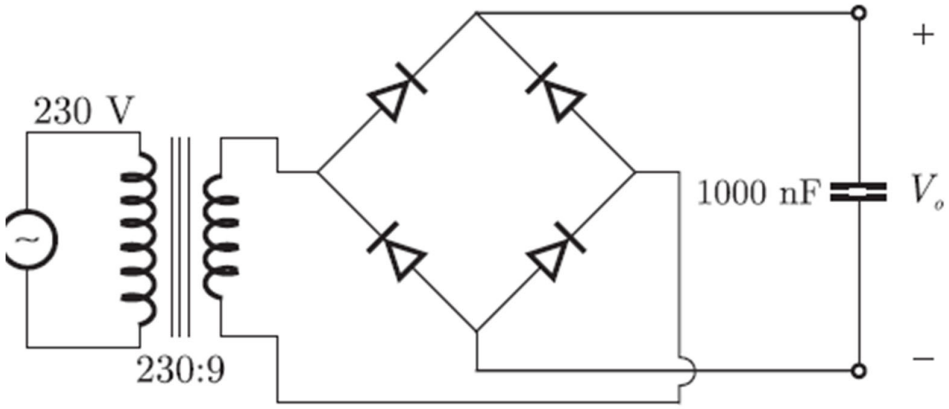
a) -6.08 V

b) 0.2 V

c) 1.2 V

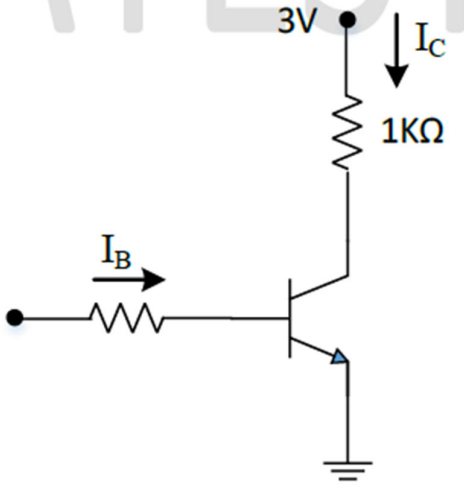
d) 6.08 V

18. The peak value of the output voltage V_0 across the capacitor shown in the figure for a 2230:9 transformer and a 230 V, 50 Hz, input assuming 0.7 V diode drop and an ideal transformer, is



a) 12.73
b) 11.33
c) 7.6
d) 9.0

19. Assuming $V_{CE}sat = 0.2$ V and $\beta = 50$, the minimum base current (I_B) required to drive the transistor in the figure to saturation is

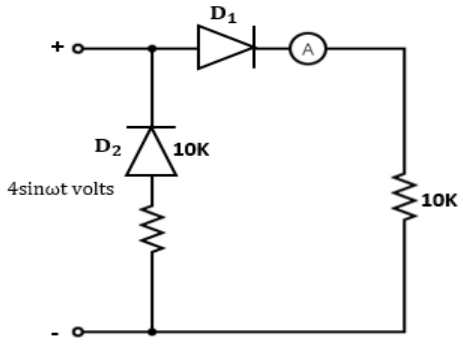


a) 56 µA
b) 140 µA
c) 60 µA
d) 3 µA

20. The current gain of a BJT is
a) gmr0
b) gm / ro
c) gmrπ
d) gm / rπ

2 mark sample questions

1. In the circuit of the given figure, assume that the diodes are ideal are ideal and the meter is an average indicating ammeter. The ammeter will read_____



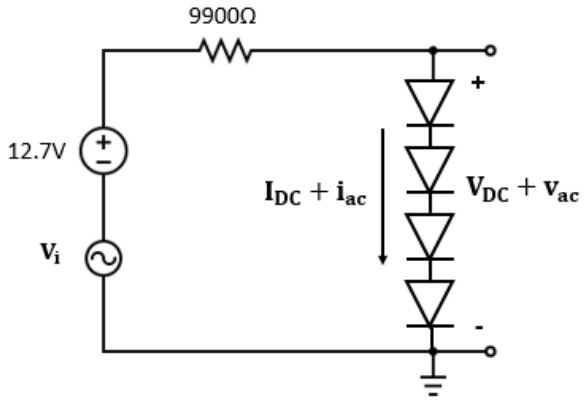
a) $0.4\sqrt{2}$A

b) 0.4 A

c) $\frac{0.8}{\pi}A$

d) $\frac{0.4}{\pi}A$

2. In circuit shown below, assume that the voltage drop across a forward bias iode is 0.7 volts. The thermal voltage $V_T = \frac{KT}{q} = 25mV$. The small signal input $V_i = 100\cos(\omega t)$ mV.



The bias current I_{DC} through the diodes is

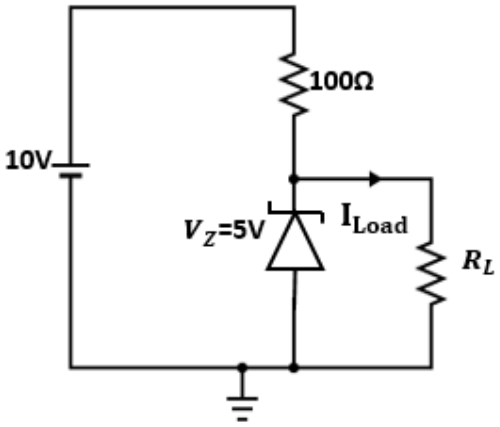
a). 1mA

b) 1.28mA

c)1.5mA

d) 2mA

3. In the circuit shown below, the knee current of ideal zener diode is 10mA. To maintain 5 volts across the load R_L, the minimum value of R_L in Ω's and the minimum power rating of the zener diode in mW respectively are:



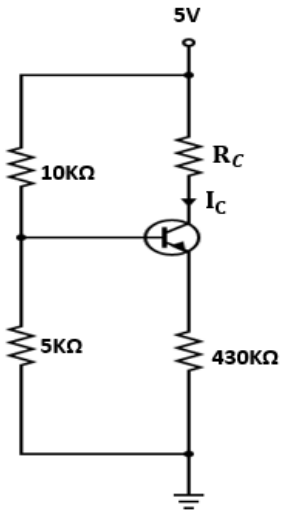
a). 125 and 125

b) 125 and 250

c)250 and 125

d) 250 and 250

4. In circuit shown, assume that the transistor is in active region. It has large β and its base emitter voltage is 0.7 volts. The value of I_C is:



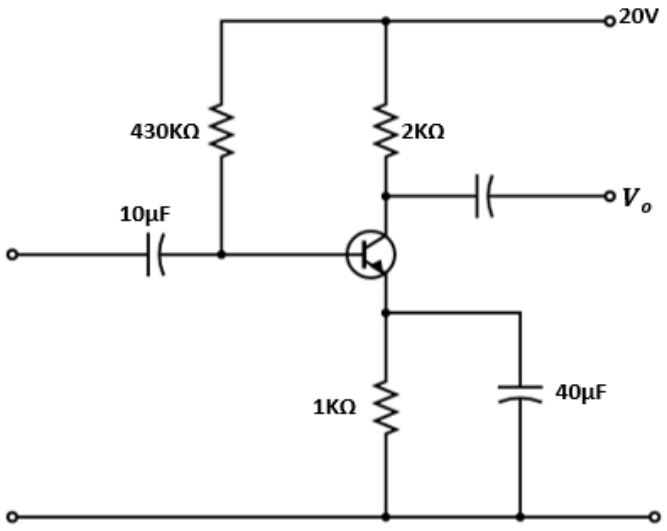
a). Indeterminate since R_C is not given

b)1mA

c)5mA

d)10mA

5. The circuit using a BJT with $\beta = 50$ and $V_{BE} = 0.7\ volts$ is shown in figure. The base current I_B and the collector voltage V_C are respectively.



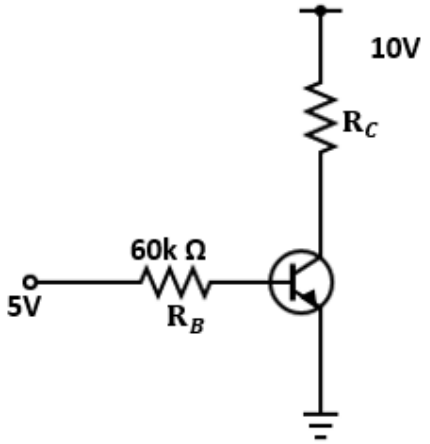
a) 43μA and 11.4 volts

b) 40μA and 16 volts

c) 45μA and 11 volts

d) 50μA and 10 volts

6. In the circuit shown, the silicon BJT has $\beta = 50$. Assume $V_{BE} = 0.7\ volts$ and $V_{CEsat} = 0.2\ volts$. Which one of the following statements is correct?



a) For $R_C = 1k\Omega$, the BJT operates in the saturation region.

b) For $R_C = 3k\Omega$, the BJT operates in the saturation region.

c) For $R_C = 20k\Omega$, the BJT operates in the cutoff region.

d) For $R_C = 20k\Omega$, the BJT operates in the linear region.

7. The quiescent collector current IC of a transistor is increased by changing resistances. As a result.

a) gm will not be affected

b) gm will decrease

c) gm will increase

d) gm will increase or decrease depending upon bias stability.

8. A common-source amplifier with a drain resistance, R_D = 4.7 kΩ is powered using a 10 V power supply. Assuming that the transconductance, g_m, is 520 μA/V, the voltage gain of the amplifier is closest to:

a) -2.44

b)-1.22

c) 2.44

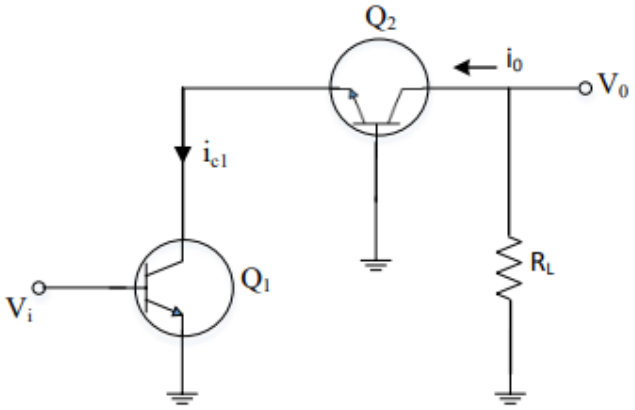
d)1.22

9. An n-channel JEFT has I_{DSS} = 2 mA and V_p = −4 V. It's transconductance g_m (in mA/V) if VGS=0V is

a) 0.5
b) 0.75
c) 1
d) 1.5

10. The pinch off voltage for a n – channel JFET is 4 V, when VGS = 1 V, the pinch – off occurs for VDS equal to
a) 3 V
b)5 V
c) 4 V
d)1 V

11. In the cascode amplifier shown in the figure, if the common-emitter stage (Q1) has a trans conductance gm1 and the common base stage (Q2) has a trans conductance gm2 then the overall trans conductance g(=i0 / Vi) of the cascode amplifier is



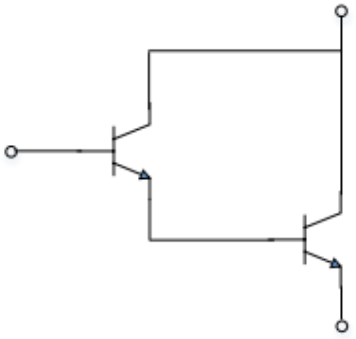
a) gm1

b) gm2

c) gm1 / 2

d) gm2 / 2

12. Each transistor in the Darlington pair (see Figure below) has hfe =100. The overall hFE of the composite transistor neglecting the leakage currents is



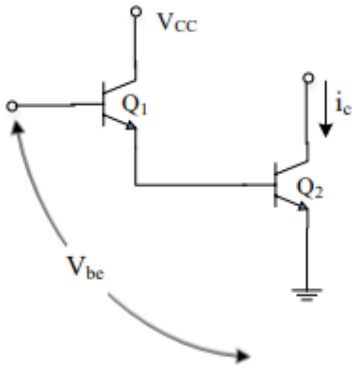
a) 10000

b) 10001

c) 10100

d) 10200

13. A Darlington stage is shown in the fig, if the trans conductance of Q1 is given by gm1 and Q2 by gm2 then total transconductance is given by



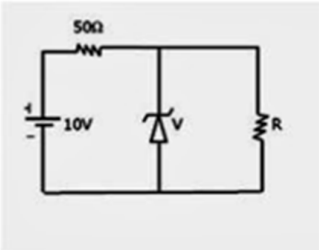
a) gm1

b) 0.5 gm1

c) gm2

d) 0.5 gm2

14. The 6 V Zener diode shown in figure has zero zener resistance and a knee current of 5mA. The minimum value of R so that the voltage across it does not fall below 6V is



a)1.2kΩ

b)80Ω

c) 50Ω

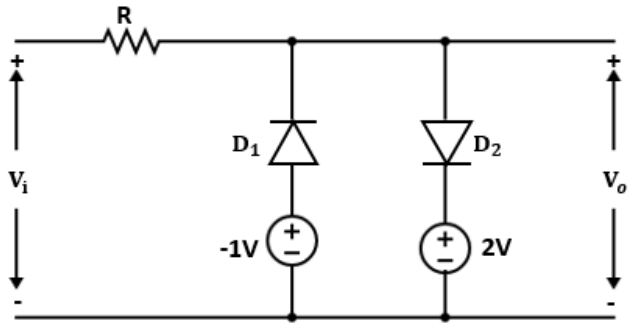
d)0Ω

15. A DC power supply has a no-load voltage of 30V, and a full load voltage of 25V at a full load current of one amp. Its output resistance and load regulation, respectively are

a) 5Ω and 20%
b) 25Ω and 20%

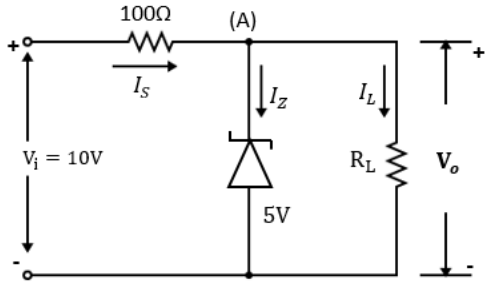
c) 5Ω and 16.7%
d) 25Ω and 16.7%

16. Two silicon diodes, with a forward voltage drop of 0.7 volts, are used in the circuit shown in the figure. The range of input voltage V_i for which the output voltage $V_0 = V_i$, is

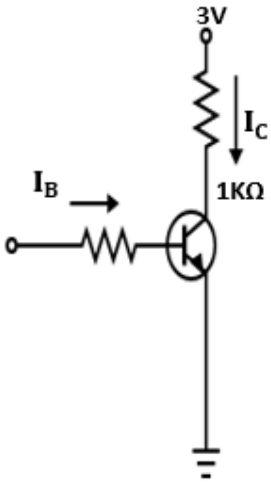


a). -3.0 volts < V_i<1.3 volts
b). -0.3 volts < V_i<2 volts
c). -1.0 volts < V_i<2.0 volts
d). -1.7 volts < V_i<2.7 volts

17. In the following circuit the 5V zener diode requires a minimum current of 10mA. For obtaining a regulated output of 5V the maximum permissible load current (I_L), is _____mA and the minimum power rating of zener diode is ____W.



18. Assuming $V_{CEsat} = 0.2\ volts$ and $\beta = 50$, the minimum base current (I_{Bmin}) required to drive the transistor in figure to saturation is:



a) $56\mu A$

b) $140mA$

c) $60\mu A$

d) $3mA$

19. A bipolar transistor is operating in the active region with a collector current of 1mA. Assuming that the β of the transistor is 100 and the thermal voltage (V_T) is 25mV. The Transconductance (g_m) and the input resistance (r_π) of the transistor in the common emitter configuration are:

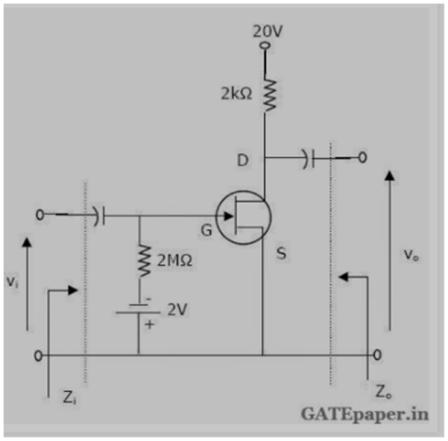
a) $g_m = 25mA/V$ and $r_\pi = 15.625K\Omega$

b) $g_m = 40mA/V$ and $r_\pi = 4.0K\Omega$

c) $g_m = 25mA/V$ and $r_\pi = 2.5K\Omega$

d) $g_m = \frac{40mA}{V}$ and $r_\pi = 2.5K\Omega$

20. Given r_d=20kΩ, I_{DSS}=10mA, V_P=-8V



a. Zi and Zo of the circuit are respectively
   a) 2MΩ and 2kΩ
   b) 2MΩ and 20/11kΩ
   c) infinity and 2kΩ
   d) infinity and 20/11kΩ

b. ID and VDS under DC conditions are respectively
   a) 5.625mA and 8.75V
   b) 7.50mA and 5.0V
   c) 4.50mA and 11.0V
   d) 6.25mA and 7.5V

c. Transconductance in milli- siemens(mS) and the voltage gain of the amplifier are
   a. 1.875mS and 3.41
   b. 1.875mS and 3.41
   c. 3.30mS and -6
   d. 3.30mS and 6