ANALOG ELECTRONICS

WORK BOOK - part 1

UNACADEMY

ESE | GATE

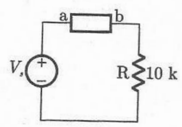
ECE | EE

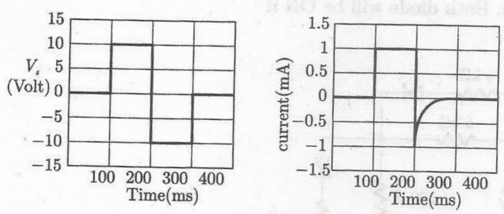
CHAPTER 1

DIODE CIRCUITS

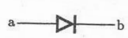
QUESTION 1.1

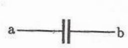
The following circuit has a source voltage V_s as shown in the graph. The current through the circuit is also shown.



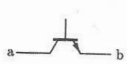


The element connected between a and b could be

(A) 

(B) 

(C) 

(D) 

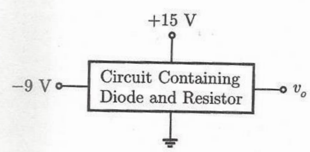
QUESTION 1.2

Given that $V_{Thermal} = 26\text{ mV}$. A diode is biased with a current of 1 mA. What is the value of the current change, if V_D (Diode voltage) changes by 1 mV?

________ μA

QUESTION 1.3

The circuit inside the box in figure shown below contains only resistor and diodes. The terminal voltage v_o is connected to some point in the circuit inside the box.



The largest and smallest possible value of v_o most nearly to is respectively

(A) 15 V, 6 V

(B) 24 V, 0 V

(C) 24 V, 6 V

(D) 15 V, −9 V

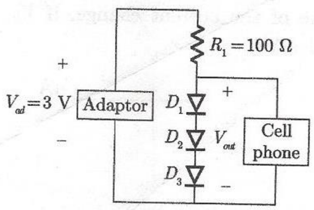
QUESTION 1.4

Ten diodes, each of them provides 0.7 V drop when the current through it is 20 mA, connected in parallel operate at a total current of 0.1 A. What current flows in each diode ?

_______ Amp

QUESTION 1.5

Having lost his 2.4 V cellphone charger, an electrical engineering student tries several stores but does not find adaptors with outputs less than 3 V. He then decides to put his knowledge of electronics to work and constructs the circuit shown in figure where three identical diodes in forward bias produce a total voltage of $V_{out} = 3V_D \simeq 2.4\text{ V}$ and resistor R_1 sustain remaining voltage. Neglect the current drawn by the cellphone and assume $V_{Thermal} = 26\text{ mV}$. The reverse saturation current I_S for the diode is



(A) 6 mA

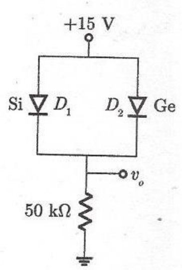
(B) 2.602×10^{-16} A

(C) 8.672×10^{-14} A

(D) 7.598×10^{-14} A

QUESTION 1.6

The diode in the circuit shown below have linear parameter of $V_\gamma = 0.7$ (for Si), $V_\gamma = 0.3$ (for Ge) and $r_f = 0$ for both the diode. What is the biasing condition of diode D_1 and D_2?



(A) D_1 – ON, D_2 – ON

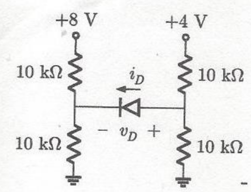
(B) D_1 – ON, D_2 – OFF

(C) D_1 – OFF, D_2 – ON

(D) D_1 – OFF, D_2 – OFF

QUESTION 1.7

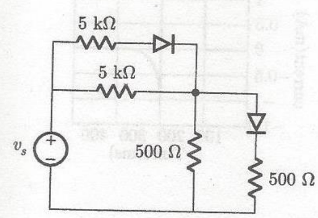
For the circuit in the figure below what is the value of v_D ?



_______ Volt

QUESTION 1.8

For the circuit shown below each diode has $V_\gamma = 0.6$ V and $r_f = 0$. Both diode will be ON if



(A) $v_s > 3.9$ V

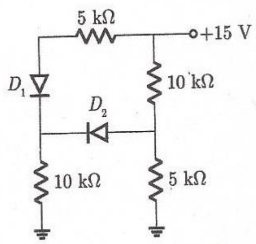
(B) $v_s > 4.9$ V

(C) $v_s > 6.3$ V

(D) $v_s > 5.3$ V

QUESTION 1.9

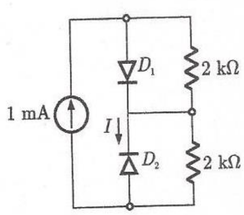
Assume that the diodes in the circuit are ideal. What are the operating states of diodes ?



	D_1	D_2
(A)	ON	ON
(B)	ON	OFF
(C)	OFF	ON
(D)	OFF	OFF

QUESTION 1.10

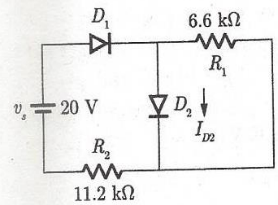
Assume that D_1 and D_2 in given figure are ideal diodes. The value of current is



_______ mA

QUESTION 1.11

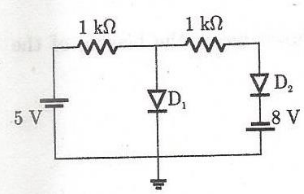
The diode in the circuit shown below have linear parameter of $V_\gamma = 0.7$ V and $r_f = 0\,\Omega$. The value of the current (I_{D2}) in diode D_2 is



_______ mA

QUESTION 1.12

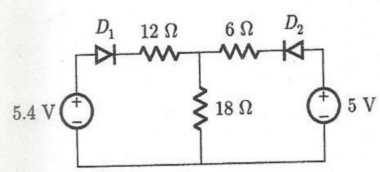
Assuming that in given circuit the diodes are ideal. The current in diode D_1 is



_______ mA

QUESTION 1.13

In the circuit shown below diodes has cutin voltage of 0.6 V. The diode in ON state are



(A) only D_1

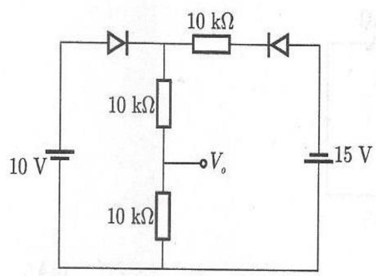
(B) only D_2

(C) both D_1 and D_2

(D) None of these

QUESTION 1.14

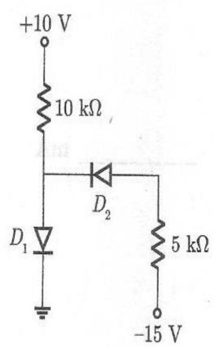
Assuming that the diodes in the given circuit are ideal, the voltage V_o is



_______ Volt

QUESTION 1.15

The diode circuit in figure shown below the biasing of the diode D_1, D_2 is



(A) ON, ON

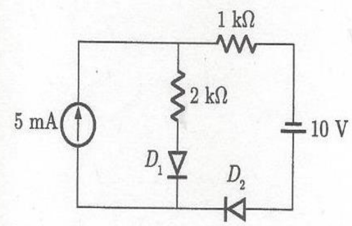
(B) ON, OFF

(C) OFF, ON

(D) OFF, OFF

QUESTION 1.16

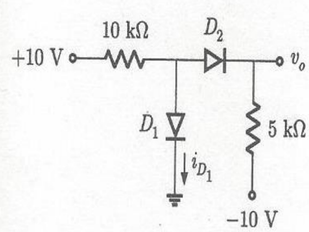
The diode circuit given below. Assume diode is ideal. The operating states of diodes D_1, D_2 are



	D_1	D_2
(A)	ON,	ON
(B)	ON,	OFF
(C)	OFF,	ON
(D)	OFF,	OFF

QUESTION 1.17

Let cutin voltage $V_\gamma = 0.7$ V for each diode in the circuit shown below.

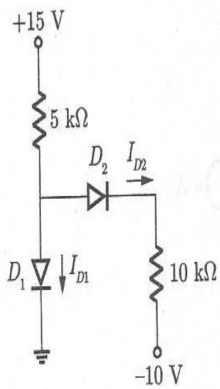


What is the voltage v_o ?

_______ V

QUESTION 1.18

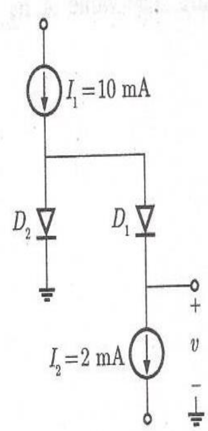
Assume that in the given circuit diodes are ideal. What is the value of I_{D2} ?



_______ mA

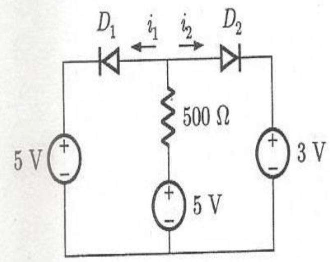
QUESTION 1.19

In the circuit shown in figure, both diodes have $\eta = 1$, but D_1 has 10 times the junction area of D_2. What is the value of voltage V ?



QUESTION 1.20

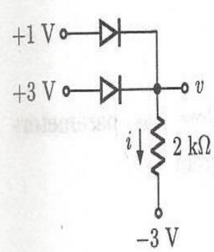
In the circuit shown below, if D_1 and D_2 are ideal diodes, What is the current i_2 ?



_______ mA

QUESTION 1.21

For the given circuit cutin voltage of diode is $V_\gamma = 0.7$. What is the value of v and i ?



(A) 2.3 V, 2.65 mA

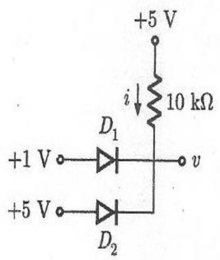
(B) 2.65 V, 2.3 mA

(C) 2 V, 0 mA

(D) 0 V, 2.3 mA

QUESTION 1.22

For the circuit shown below the value of v and i are (if the diode is ideal)



(A) +5 V, 0 mA

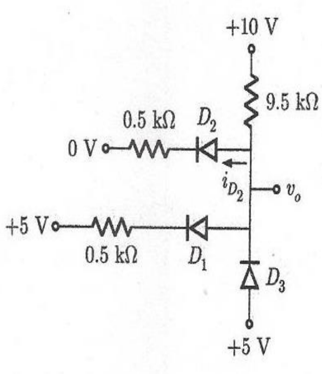
(B) +1 V, 0.6 mA

(C) +5 V, 0.4 mA

(D) +1 V, 0.4 mA

QUESTION 1.23

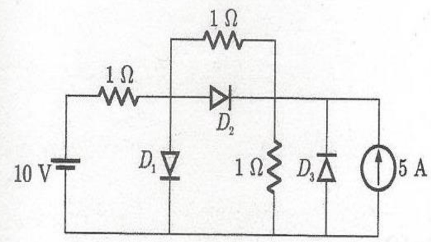
The diodes in the circuit shown below has parameters $V_\gamma = 0.6$ V and $r_f = 0$. What is the current i_{D_2} ?



_______ mA

QUESTION 1.24

What are the states of the three ideal diodes of the circuit shown in figure ?



(A) D_1 ON, D_2 OFF, D_3 OFF

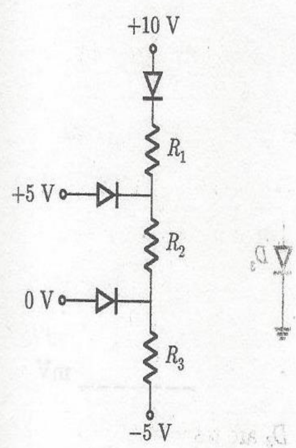
(B) D_1 OFF, D_2 ON, D_3 OFF

(C) D_1 ON, D_2 OFF, D_3 ON

(D) D_1 OFF, D_2 ON, D_3 ON

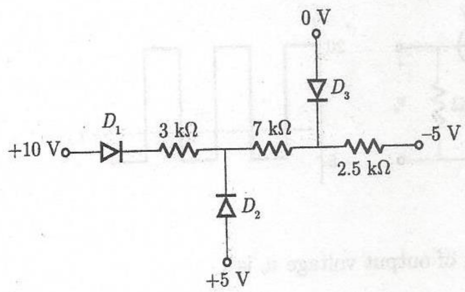
QUESTION 1.25

The cutin voltage for each diode in circuit shown below is $V_\gamma = 0.6$ V. Each diode current is 0.5 mA. The value of R_3 will be



QUESTION 1.26

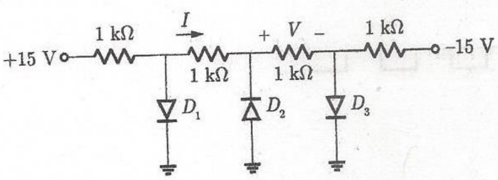
The diode circuit shown in figure. Assume that diode is ideal, what will be the biasing modes of diode D_1, D_2 and D_3? (FB → forward biased, RB → reverse biased)



	D_1	D_2	D_3
(A)	FB	FB	FB
(B)	FB	FB	RB
(C)	FB	RB	RB
(D)	FB	RB	FB

QUESTION 1.27

Assuming that the diodes are ideal in the given circuit.



Status of the diodes D_1, D_2 and D_3 are respectively

(A) ON, OFF, OFF

(B) ON, OFF, ON

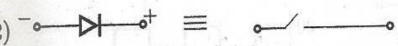
(C) ON, ON, OFF

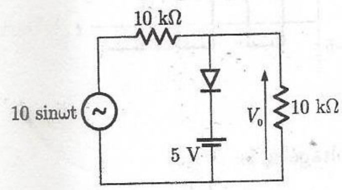
(D) ON, ON, ON

QUESTION 1.28

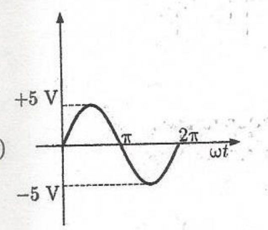
The equivalent circuit of a diode, during forward biased and reverse biased conditions, are shown in the figure.

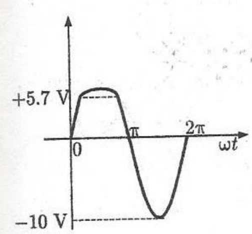
(1) 

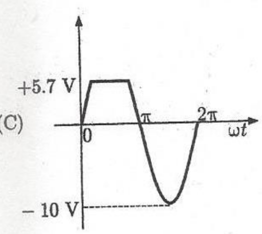
(2) 

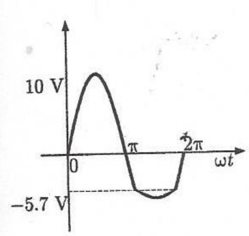


If such a diode is used in clipper circuit of figure given above, the output voltage V_o of the circuit will be

(A) 

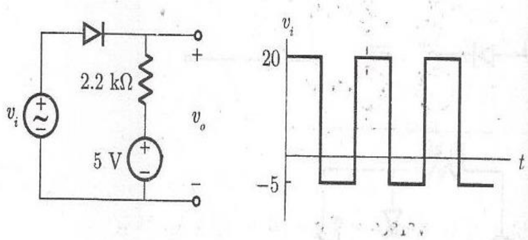
(B) 

(C) 

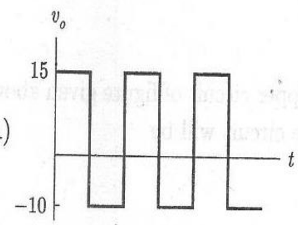
(D) 

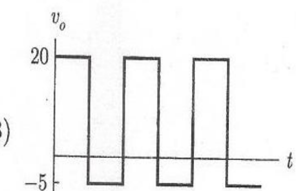
QUESTION 1.29

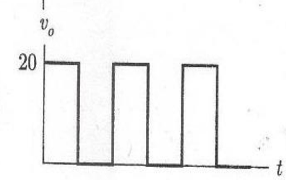
Consider the given circuit and a waveform for the input voltage, shown in figure below. The diode in circuit has cutin voltage $V_\gamma = 0$.

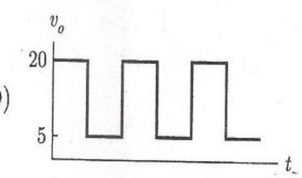


The waveform of output voltage v_o is

(A)


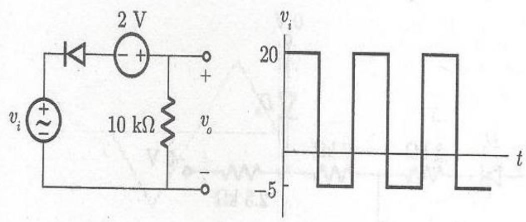
(B)


(C)


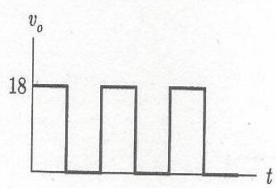
(D)


QUESTION 1.30

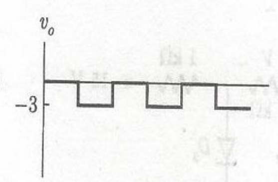
Consider the given circuit and a waveform for the input voltage, shown in figure below. The diode in circuit has cutin voltage $V_\gamma = 0$.

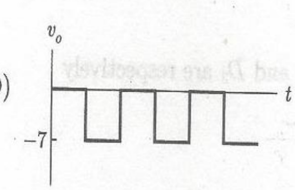


The waveform of output voltage v_o is

(A)


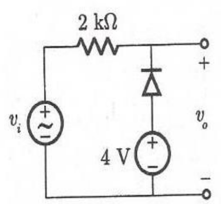
(B)

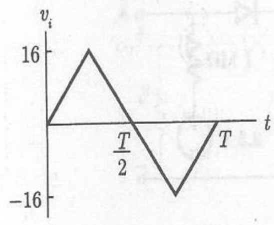

(C)


(D)


QUESTION 1.31

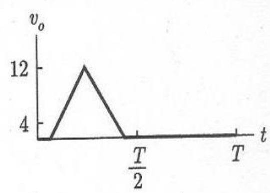
Consider the given circuit and a waveform for the input voltage, shown in figure below. The diode in circuit has cutin voltage $V_\gamma = 0$.



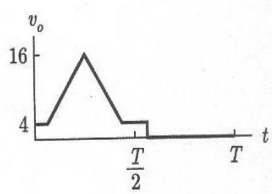


The waveform of output voltage v_o is

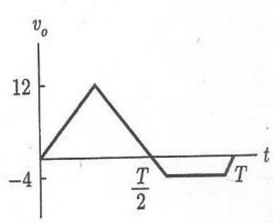
(A)



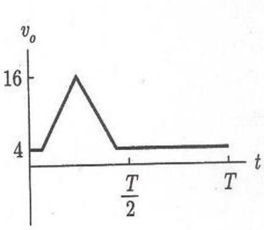
(B)



(C)

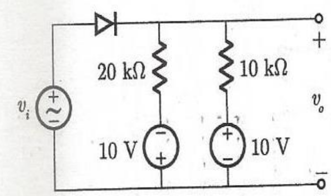


(D)



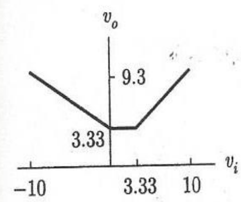
QUESTION 1.32

For the circuit shown below, let cut in voltage $V_\gamma = 0.7$ V.

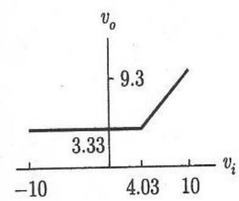


The plot of v_o verses v_i for $-10 \le v_i \le 10$ V is

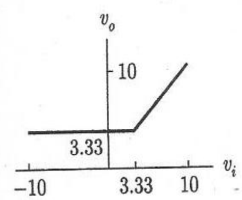
(A)



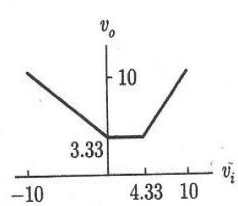
(B)



(C)

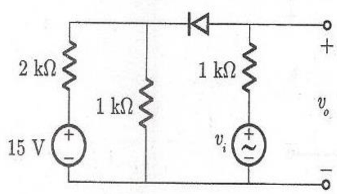


(D)

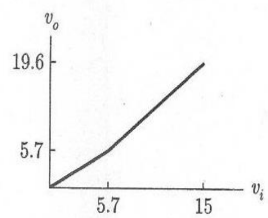


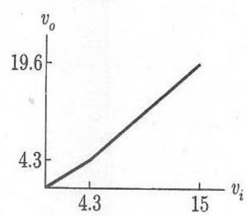
QUESTION 1.33

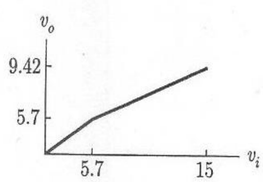
For the circuit shown below the cutin voltage of diode is $V_\gamma = 0.7$ V.

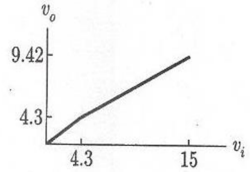


The plot of v_o versus v_i is

(A)


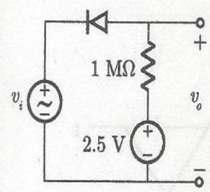
(B)


(C)


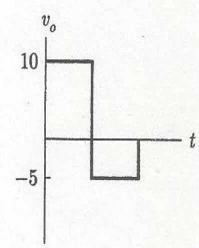
(D)


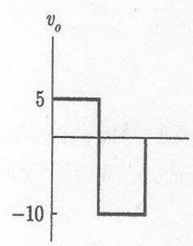
QUESTION 1.34

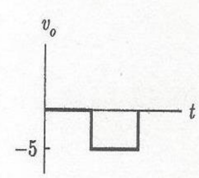
A symmetrical 5 kHz square wave whose output varies between +10 V and −10 V is impressed upon the clipping shown in figure below

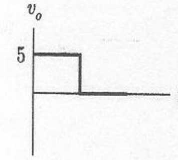


If diode has $r_f = 0$ and $r_r = 2$ MΩ and $V_\gamma = 0$, the output waveform is

(A)


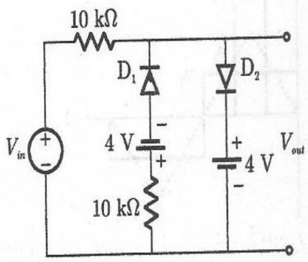
(B)


(C)


(D)


QUESTION 1.35

A voltage signal $10 \sin \omega t$ is applied to the circuit with ideal diodes, as shown in figure, The maximum, and minimum values of the output waveform V_{out} of the circuit are respectively



(A) +10 V and −10 V

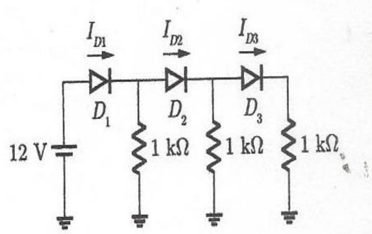
(B) +4 V and −4 V

(C) +7 V and −4 V

(D) +4 V and −7 V

QUESTION 1.36

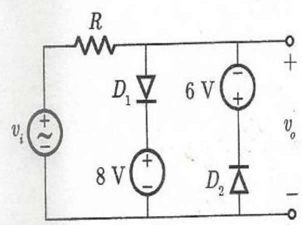
Assume that the voltage drop across each of the diodes in the circuit shown below is 0.7 V. The value of current through diode D_1, is I_{D1} =

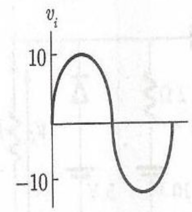


_______ mA

QUESTION 1.37

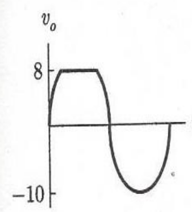
Consider the given circuit and a waveform for the input voltage. The diode in circuit has cutin voltage $V_\gamma = 0$.



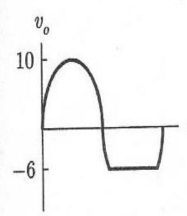


The waveform of output voltage v_o is

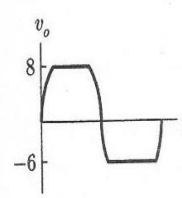
(A)



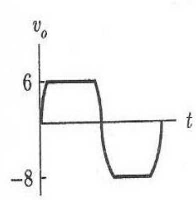
(B)



(C)

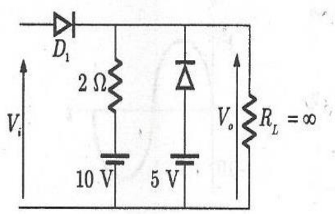


(D)

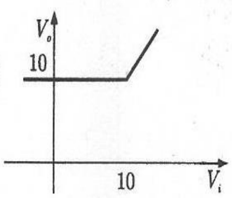


QUESTION 1.38

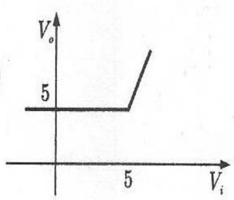
Assuming the diodes D_1 and D_2 of the circuit shown in figure to be ideal ones, the transfer characteristics of the circuit will be



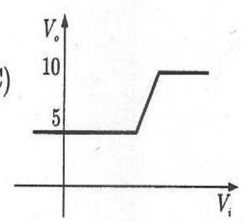
(A)



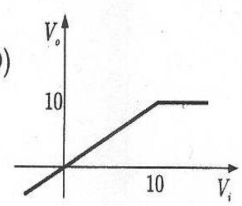
(B)



(C)

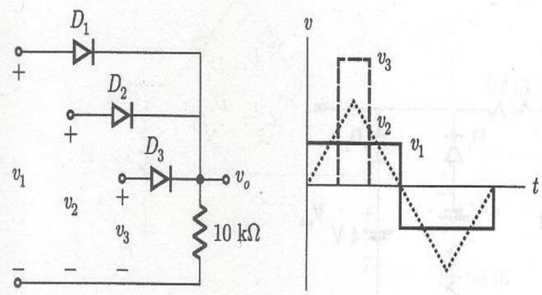


(D)



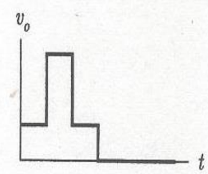
QUESTION 1.39

In the circuit shown below, the three signals of fig are impressed on the input terminals.

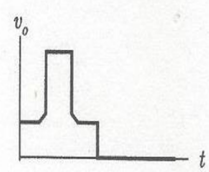


If diode are ideal then the voltage v_o is

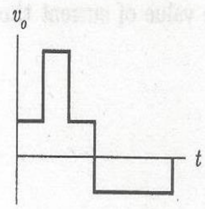
(A)



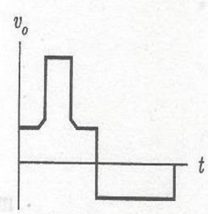
(B)



(C)

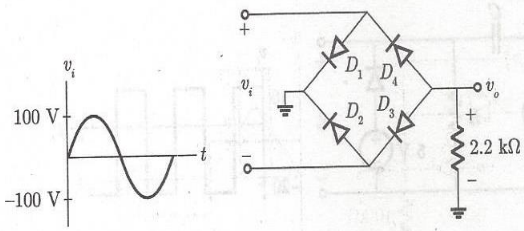


(D)



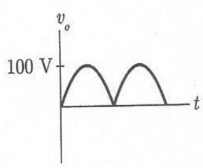
QUESTION 1.40

Consider the given a circuit and a waveform for the input voltage.

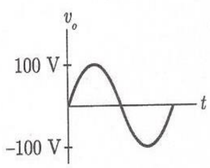


If the diode has cut in voltage $V_\gamma = 0$, the output waveform of the circuit is

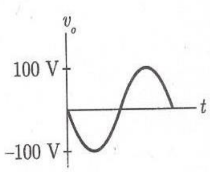
(A)



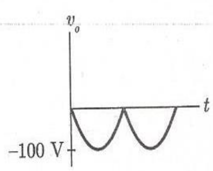
(B)



(C)

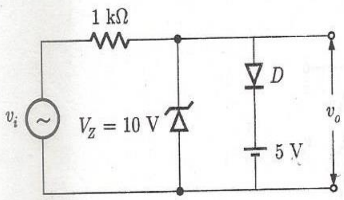


(D)



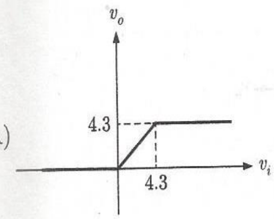
QUESTION 1.41

A clipper circuit is shown below.

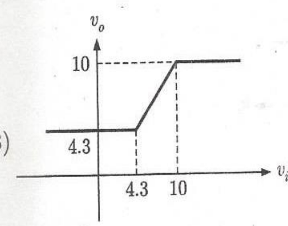


Assuming forward voltage drops of the diodes to be 0.7 V, the input-output transfer characteristics of the circuit is

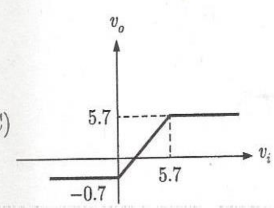
(A)



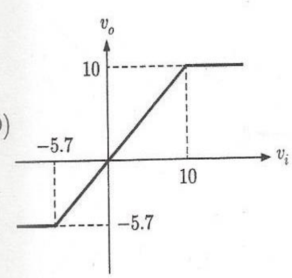
(B)



(C)

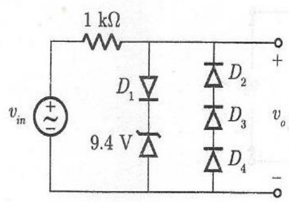


(D)



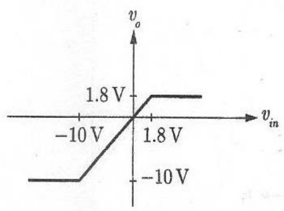
QUESTION 1.42

Consider the given circuit. The diode in circuit has cut in voltage $V_\gamma = 0.6$ V and zener diode voltage $V_z = 9.4$ V.

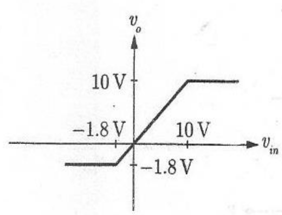


Plot v_o versus v_i is

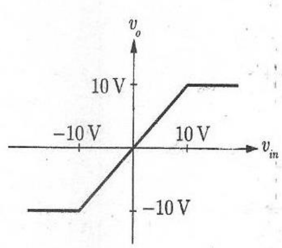
(A)



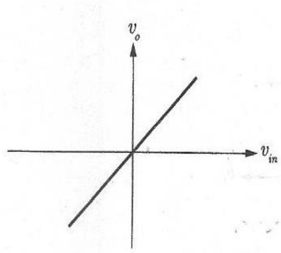
(B)



(C)

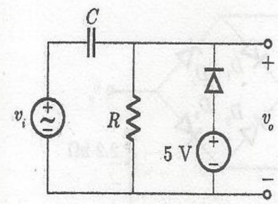


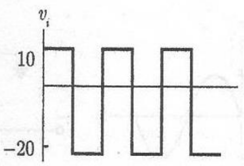
(D)



QUESTION 1.43

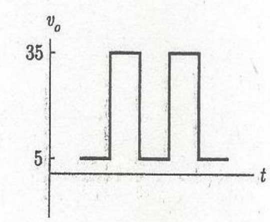
For the circuit shown below, the input voltage v_i is as shown in figure.



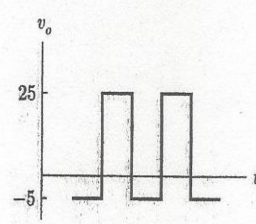


Assume the RC time constant large and cutin voltage $V_\gamma = 0$. The output voltage v_o is

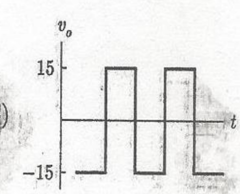
(A)



(B)



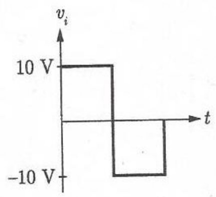
(C)

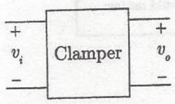


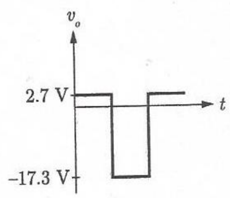
(D) None of the above

QUESTION 1.44

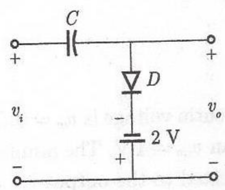
Assume that the diode cut in voltage for the circuit shown below is $V_\gamma = 0.7\text{V}$. Which of clamper circuit perform the function shown below ?



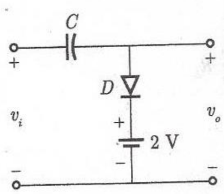




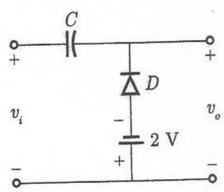
(A)



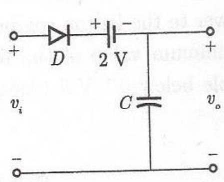
(B)



(C)

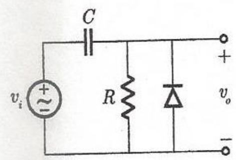


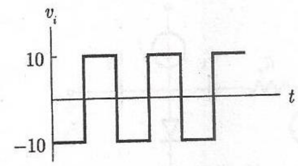
(D)



QUESTION 1.45

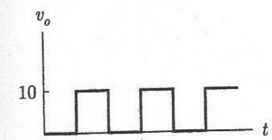
For the circuit shown below the input voltage v_i is as shown in figure.



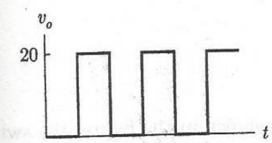


Assume the RC time constant large and cutin voltage of diode $V_\gamma = 0$. The output voltage v_o is

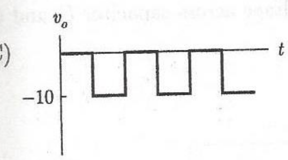
(A)



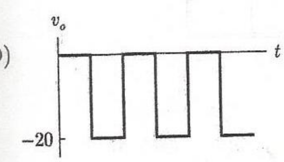
(B)



(C)

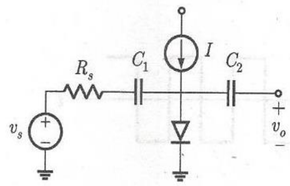


(D)



QUESTION 1.46

In the circuit I is DC current and capacitors are very large. Using small signal model which of following is correct ?



(A) $v_o = v_s \dfrac{\eta V_T}{\eta V_T + IR_s}$

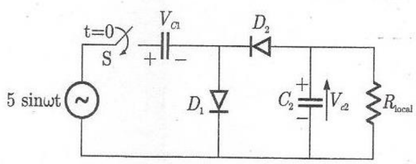
(B) $v_o = v_s$

(C) $v_o = \dfrac{v_s}{\eta V_T + IR_S}$

(D) $v_o = 0$

QUESTION 1.47

In the voltage doubler circuit shown in the figure, the switch 'S' is closed at $t = 0$. Assuming diodes D_1 and D_2 to be ideal, load resistance to be infinite and initial capacitor voltages to be zero. The steady state voltage across capacitor C_1 and C_2 will be



(A) $V_{c1} = 10\text{ V}, V_{c2} = 5\text{ V}$

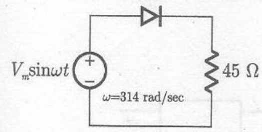
(B) $V_{c1} = 10\text{ V}, V_{c2} = -5\text{ V}$

(C) $V_{c1} = 5\text{ V}, V_{c2} = 10\text{ V}$

(D) $V_{c1} = 5\text{ V}, V_{c2} = -10\text{ V}$

QUESTION 1.48

The forward resistance of the diode shown in Figure is $5\,\Omega$ and the remaining parameters are same at those of an ideal diode. The dc component of the source current is



(A) $\dfrac{V_m}{50\pi}$

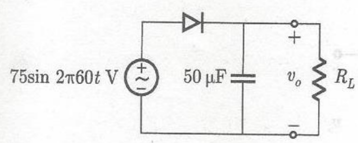
(B) $\dfrac{V_m}{50\pi\sqrt{2}}$

(C) $\dfrac{V_m}{100\pi\sqrt{2}}$

(D) $\dfrac{2V_m}{50\pi}$

QUESTION 1.49

For the circuit shown below diode cutin voltage is $v_{in} = 0$. The ripple voltage is to be no more than $v_{rip} = 4$ V. The minimum load resistance, that can be connected to the output is



_______ kΩ

QUESTION 1.50

A transformer convert the 110 V, 60 Hz line voltage to a peak to peak swing of 9 V. A half wave rectifier follows the transformer to supply the power to the laptop computer of $R_L = 0.436\,\Omega$. What is the minimum value of the filter capacitor that maintains the ripple below 0.1 V ? (Assume $V_{D,on} = 0.8$ V)

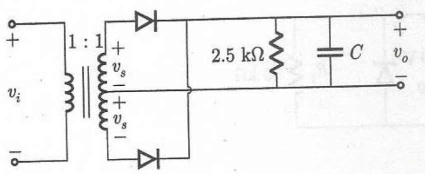
_______ Farad

QUESTION 1.51

The input to full-wave rectifier shown below is

$$v_i = 120 \sin 2\pi 60t \text{ V}$$

The diode cutin voltage is 0.7 V. If the output voltage cannot drop below 100 V, the required value of the capacitor is



________ μF

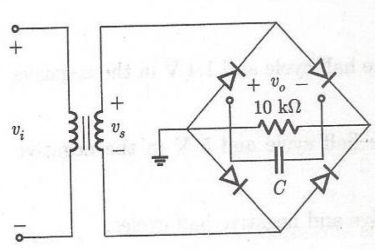
QUESTION 1.52

A full wave rectifier is driven by a sinusoidal input $V_{in} = V_o \cos \omega t$, where $V_o = 3$ V and $\omega = 2\pi(60 \text{ Hz})$. Assuming $V_{D,on} = 800$ mV, what is the value of the ripple amplitude with a 1000 μF smoothing capacitor and a load resistance of 30 Ω ?

________ Volt

QUESTION 1.53

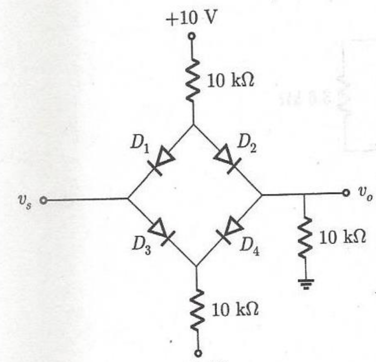
The secondary transformer voltage of the rectifier circuit shown below is $v_s = 60 \sin 2\pi 60t$ V. Each diode has a cut in voltage of $V_\gamma = 0.7$ V. The ripple voltage is to be no more than $v_{rip} = 2$ V. The value of filter capacitor will be .



________ μF

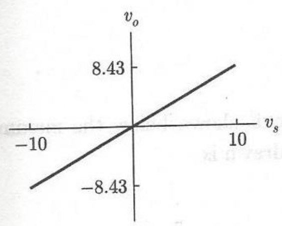
QUESTION 1.54

For the circuit shown below each diode has $V_\gamma = 0.7$ V.

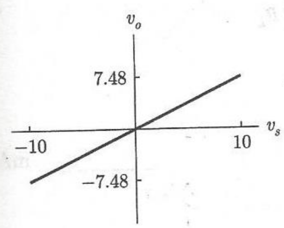


The v_o for $-10 \le v_s \le 10$ V is

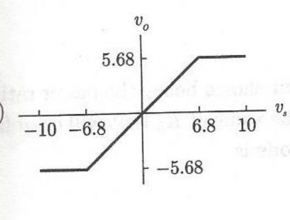
(A)



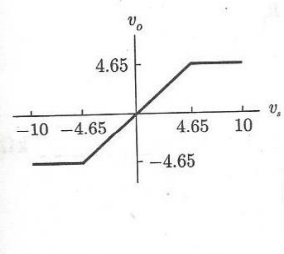
(B)



(C)

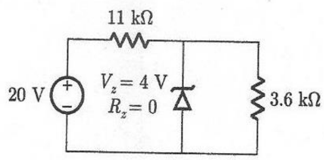


(D)



QUESTION 1.55

The Q-point for the Zener diode shown below is



(A) (0.34 mA, 4 V)

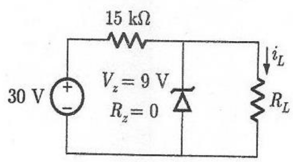
(B) (0.34 mA, 4.93 V)

(C) (0.94 mA, 4 V)

(D) (0.94 mA, 4.93 V)

QUESTION 1.56

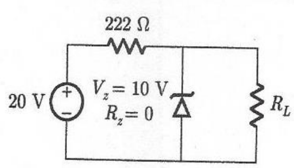
In the voltage regulator circuit shown below the maximum load current i_L that can be drawn is



_______ mA

QUESTION 1.57

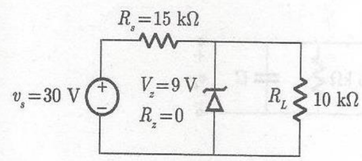
In the voltage regulator circuit shown below the power rating of Zener diode is 400 mW. The value of R_L that will establish maximum power in Zener diode is



_______ kΩ

QUESTION 1.58

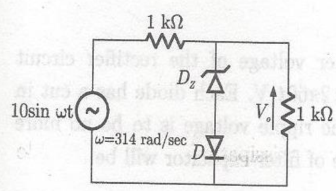
The voltage regulator shown below, what are the nominal and worst case values of zener diode current if the power supply voltage, zener break down voltage and registor all have 5 % tolerance?



	I_z^{nom}	I_z^{nom}	$I_{z(min)}^{worst}$
(A)	1.2 mA	0 mA	0 mA
(B)	0.5 mA	0.70 mA	0.103 mA
(C)	0.5 mA	0.60 mA	0.346 mA
(D)	0.5 mA	0.796 mA	0.215 mA

QUESTION 1.59

The cut-in voltage of both zener diode D_Z and diode D shown in Figure is 0.7 V, while break-down voltage of D_Z is 3.3 V and reverse break-down voltage of D is 50 V. The other parameters can be assumed to be the same as those of an ideal diode. The values of the peak output voltage (V_o) are



(A) 3.3 V in the positive half cycle and 1.4 V in the negative half cycle.

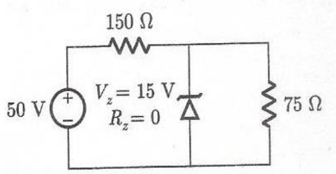
(B) 4 V in the positive half cycle and 5 V in the negative half cycle.

(C) 3.3 V in both positive and negative half cycles.

(D) 4 V in both positive and negative half cycle

QUESTION 1.60

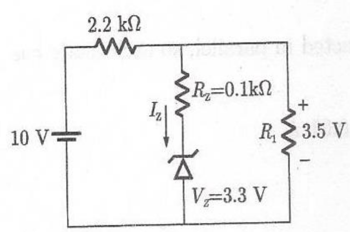
In the voltage regulator shown below the power dissipation in the Zener diode is



_______ Watt

QUESTION 1.61

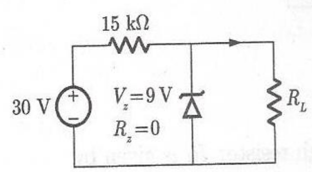
The current through the Zener diode in figure is



_______ mA

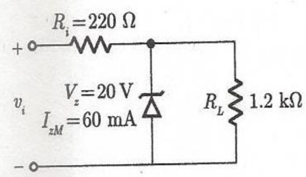
QUESTION 1.62

If $R_L = \infty$, the value of power dissipation in the zener diode is



QUESTION 1.63

In the voltage regulator circuit below rating of zener diode is given, then the range of values of v_i that will maintain the zener diode in the 'ON' state is



(A) $16.87 < v_i < 36.87$ V

(B) $16.87 < v_i < 23.67$ V

(C) $23.67 < v_i < 36.87$ V

(D) None of the above

****

Answer

1.1	A
1.2	38.4
1.3	D
1.4	0.01
1.5	B
1.6	C
1.7	-2
1.8	A
1.9	B
1.10	0
1.11	1.55
1.12	0
1.13	C
1.14	5
1.15	B
1.16	C
1.17	-3.57
1.18	0
1.19	92.22
1.20	4
1.21	A
1.22	A
1.23	7.6
1.24	A
1.25	2.93
1.26	D
1.27	C
1.28	A
1.29	D
1.30	C
1.31	D
1.32	B

1.33	C
1.34	B
1.35	D
1.36	31.8
1.37	C
1.38	A
1.39	B
1.40	D
1.41	C
1.42	B
1.43	A
1.44	B
1.45	B
1.46	A
1.47	D
1.48	A
1.49	6.25
1.50	1.417
1.51	20.6
1.52	0.389
1.53	24.4
1.54	D
1.55	B
1.56	1.4
1.57	2
1.58	D
1.59	B
1.60	0.5
1.61	2
1.62	12.6
1.63	C

CHAPTER 2

BJT BIASING

se $V_{BE(ON)} = 0.7$ V, $V_{CE(sat)} = 0.2$ V for *npn* transistor if not iven in problem.

UESTION 2.1

hoose the correct one from among the alternatives A, B, , D after matching an item from Group 1 with the most ppropriate item in Group 2.

Group 1	Group 2
1. Emitter bias	P. Operating point
2. Transistor switch	Q. Negative feedback
3. Thermal runaway	R. Positive feedback
4. Active region	S. Forward-biased base-emitter junction and reverse-biased collector-emitter junction
	T. Cut-off and saturation
	U. Zero V_{BE} and V_{CE}

(A) 1-Q, 2-T, 3-P, 4-S

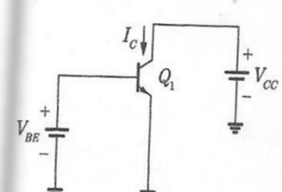
(B) 1-R, 2-T, 3-R, 4-Q

(C) 1-U, 2-P, 3-S, 4-R

(D) 1-T, 2-Q, 3-P, 4-S

QUESTION 2.2

Consider the circuit shown below what happen to the transconductance of Q_1 if the area of the device is in increased by a factor of n ?



(A) unchanged

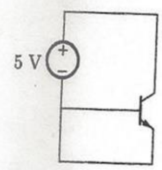
(B) increased by a factor of n

(C) decreased by a factor of n

(D) increase by a factor of $n/2$

QUESTION 2.3

Consider the circuit shown below.



What is the region of operation ?

(A) Cutoff region

(B) Forward active region

(C) Saturation region

(D) Reverse active region

QUESTION 2.4

In the fixed-bias configuration if the supply voltage changes, the slope of the load line

(A) increases

(B) decreases

(C) remains the same

(D) may increase or decrease

QUESTION 2.5

In cut-off, the value of V_{CE} is

(A) 0 V

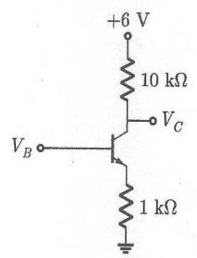
(B) V_{CC}

(C) minimum

(D) $V_{BE} = 0.6$ V

QUESTION 2.6

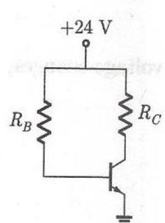
For the given circuit $V_B = V_C$ and $\beta = 50$. The value of V_B is



________ Volt

QUESTION 2.7

For the circuit shown below the Q-point is $V_{CEQ} = 12$ V and $I_{CQ} = 2$ mA when $\beta = 60$. The value of resistor R_C and R_B are



(A) 10 kΩ, 241 kΩ

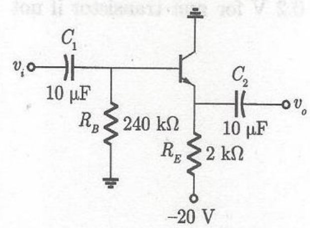
(B) 10 kΩ, 699 kΩ

(C) 6 kΩ, 699 kΩ

(D) 6 kΩ, 241 kΩ

QUESTION 2.8

For the circuit shown below $\beta = 90$, the value of V_{CEQ} and I_E respectively is



(A) 19.3 V, 9.65 mA

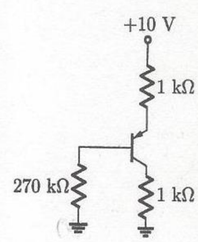
(B) 0.2 V, 9.9 mA

(C) 11.68 V, 4.16 mA

(D) 11.07 V, 4.46 mA

QUESTION 2.9

The common emitter forward current gain of the transistor shown is $\beta_F = 100$



The transistor is operating in

(A) Saturation region

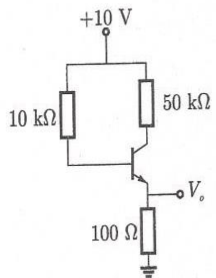
(B) Cutoff region

(C) Reverse active region

(D) Forward active region

QUESTION 2.10

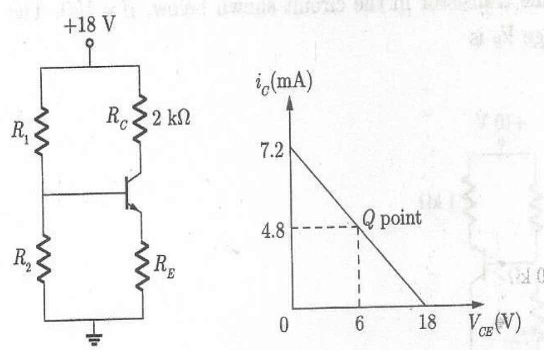
The transistor circuit shown uses a silicon transistor with $V_{BE} = 0.7, I_C \approx I_E$ and a dc current gain of 100. The value of V_o is



_______ Volt

QUESTION 2.11

The transistor circuit and its dc load line is shown in figure a and b.



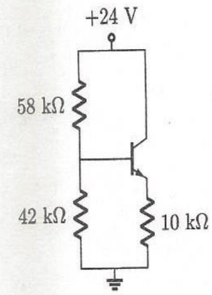
(a) (b)

For the transistor, $\beta = 120$. What is the value of emitter resistance (R_E) at Q-point ?

_______ kΩ

QUESTION 2.12

The current gain of the transistor in the circuit shown below is $\beta = 125$. The Q-point values (I_{CQ}, V_{CEQ}) are



(A) (0.418 mA, 20.4 V)

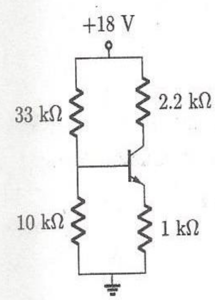
(B) (0.915 mA, 14.8 V)

(C) (0.915 mA, 16.23 V)

(D) (0.418 mA, 18.43 mV)

QUESTION 2.13

The current gain of the transistor shown below is $\beta = 50$. The Q-point (I_C, V_{CE}) is



(A) (4.18 mA, 6.84 V)

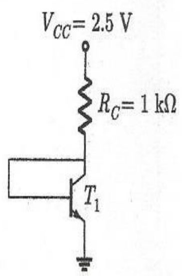
(B) (2.97 mA, 8.44 V)

(C) (6.434 mA, 4.46 V)

(D) None of these

QUESTION 2.14

For the circuit shown in the figure, we have $I_S = 8 \times 10^{-16}$ A, $\beta = 100$. What is the value of operating point ?



(A) $I_C = 1.74$ mA, $V_{CE} = 739$ mV

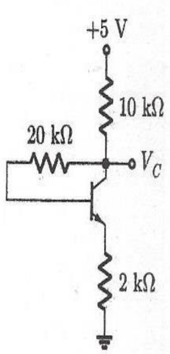
(B) $I_C = 1.74$ mA, $V_{CE} = 839$ mV

(C) $I_C = 174$ mA, $V_{CE} = 739$ mV

(D) $I_C = 174$ mA, $V_{CE} = 839$ mV

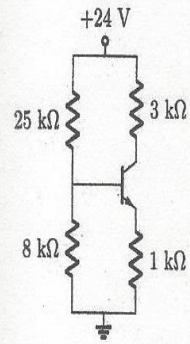
QUESTION 2.15

The common-emitter current gain of the transistor is $\beta = 75$. The voltage V_{BE} in ON state is 0.7 V. The value of V_C is



QUESTION 2.16

For the circuit shown below, let $\beta = 75$. The Q-point (I_{CQ}, V_{CEQ}) is



(A) (4.68 mA, 16.46 V)

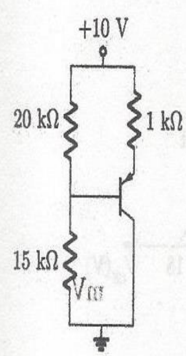
(B) (3.12 mA, 186 V)

(C) (3.12 mA, 8.46 V)

(D) (4.68 mA, 5.22 V)

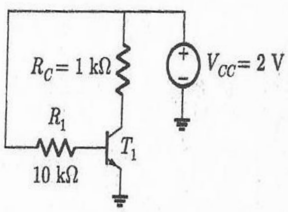
QUESTION 2.17

For the transistor in the circuit shown below, $\beta = 100$. The voltage V_B is



QUESTION 2.18

Consider the circuit given in figure, assume $I_S = 3 \times 10^{-16}$ A. What is the value of V_B that makes the circuit to operate at the edge of saturation region ?



_______ mV

QUESTION 2.19

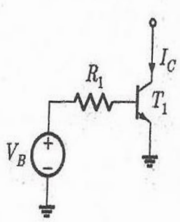
For the circuit shown in figure, given that $\beta = 100$

$I_S = 7 \times 10^{-16}$

$R_1 = 10\,\text{k}\Omega$ and

$I_C = 1 \times 10^{-3}$ A.

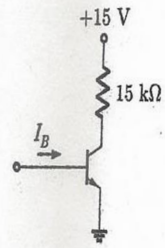
What is the value of V_B ?



_______ mV

QUESTION 2.20

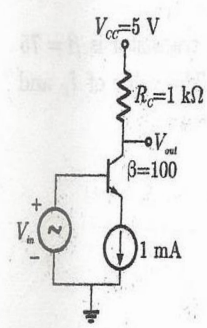
In the circuit shown below $V_{CE(sat)} = 0.2$ V, $\alpha = 0.99$, $I_B = 20\,\mu$A. The value of V_{CE} is



_______ Volt

QUESTION 2.21

The common emitter amplifier shown in the figure is biased using a 1 mA ideal current source. The approximate base current value is



(A) 0 μA

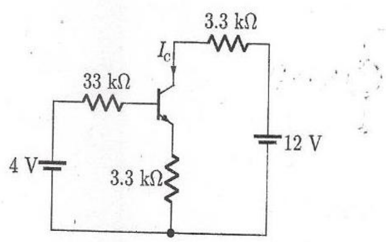
(B) 10 μA

(C) 100 μA

(D) 1000 μA

QUESTION 2.22

In the circuit of figure, assume that the transistor has $h_{fe} = 99$ and $V_{BE} = 0.7$ V. The value of collector current I_C of the transistor is approximately



(A) [3.3/3.3] mA

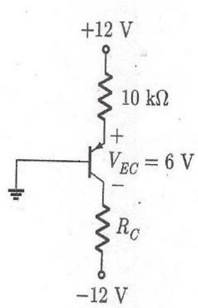
(B) [3.3/(3.3+0.33)] mA

(C) [3.3/0.33] mA

(D) [3.3(33+3.3)] mA

QUESTION 2.23

The common-emitter current gain of the transistor is $\beta = 75$. The voltage V_{BE} in ON state is 0.7 V. The value of I_E and R_C are



(A) 1.46 mA, 6.74 kΩ

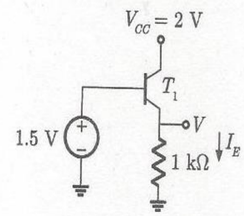
(B) 0.987 mA, 3.04 kΩ

(C) 1.13 mA, 5.98 kΩ

(D) None of the above

QUESTION 2.24

Consider the circuit shown in figure. What is the value of current I_E and voltage V? (Assume $I_S = 6 \times 10^{-16}$ A, $V_T = 26 \times 10^{-3}$ V, $\beta >> 1$)



(A) 775 mA, 775 mV

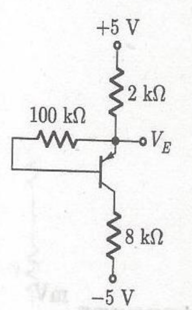
(B) 800 mA, 800 mV

(C) 695 mA, 695 mV

(D) 215 mA, 215 V

QUESTION 2.25

In the circuit shown below voltage $V_E = 4$ V. The values of α and β are respectively



(A) 0.943, 17.54

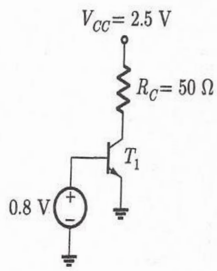
(B) 0.914, 17.54

(C) 0.914, 10.63

(D) 0.914, 11.63

QUESTION 2.26

For the circuit shown below $\beta = 100$, $V_{BE} = 0.8$ V, $I_S = 8 \times 10^{-16}$ A. What is the operating point of the circuit ?



(A) $I_C = 18.5$ mA, $V_{CE} = 0.8$ V

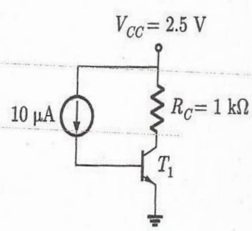
(B) $I_C = 18.5$ mA, $V_{CE} = 1.58$ V

(C) $I_C = 8 \times 10^{-6}$ mA, $V_{CE} = 15.8$ V

(D) $I_C = 18.5$ mA, $V_{CE} = 2.58$ V

QUESTION 2.27

For the circuit shown in figure given that $I_S = 8 \times 10^{-16}$ A, $\beta = 100$ and $V_{BE} = 0.8$ V. What is the operating point value ?



(A) $I_C = 1.5$ mA, $V_{CE} = 1.5$ V

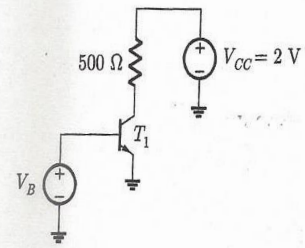
(B) $I_C = 10$ mA, $V_{CE} = 1.5$ V

(C) $I_C = 1$ mA, $V_{CE} = 1.5$ V

(D) $I_C = 4$ mA, $V_{CE} = 1.5$ V

QUESTION 2.28

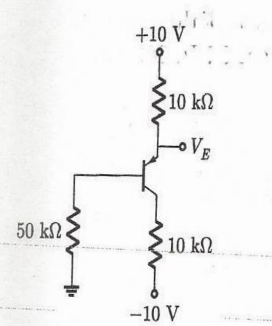
Assume $I_S = 5 \times 10^{-16}$ and the circuit shown below is at the edge of active region. What is the approximate value of voltage V_B ?



_______ V

QUESTION 2.29

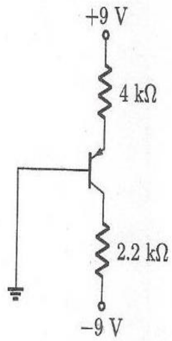
For the given circuit emitter voltage is $V_E = 2$ V. The value of α is



____

QUESTION 2.30

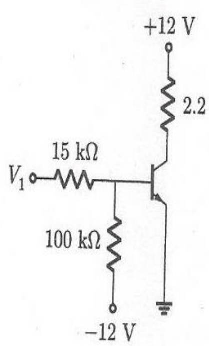
For the circuit shown below $\alpha = 0.992$. The value of voltage V_{BC} is



-------- Volt

QUESTION 2.31

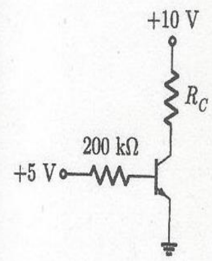
For the transistor shown below, $\beta = 30$ and $V_{CEQ} = 6$ V. The value of V_1 is



-------- Volt

QUESTION 2.32

A silicon transistor with $V_{BE(sat)} = 0.8$ V, $\beta = h_{FE} = 100$, $V_{CE(sat)} = 0.2$ V is used in the circuit shown. The minimum value of R_C for which the transistor remain in saturation, is

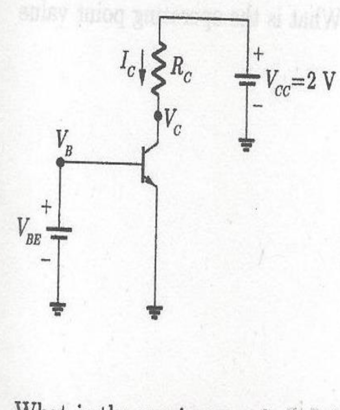


-------- kΩ

QUESTION 2.33

Consider the circuit shown in figure below. Given the transistor parameters:

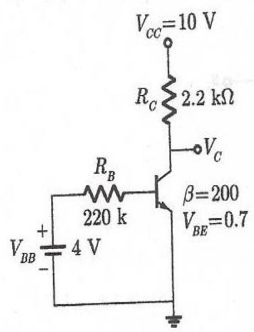
$I_S = 5 \times 10^{-17}$ Am, $V_{BE} = 800$ mA and $\beta = 100$; $V_{thermal} = 26$ mV.



What is the maximum value of R_C such that the transistor remains in the active mode ?

QUESTION 2.34

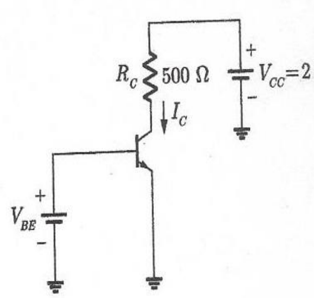
For the given circuit, the value of collector voltage (V_C) is



-------- Volt

QUESTION 2.35

Consider the circuit shown in figure below. Given that saturation current $I = 5 \times 10^{-17}$ Amp, $V_{BE} = 800\,\text{mV}$ and $\beta = 100$ ($V_{\text{thermal}} = 26\,\text{mV}$).



The transistor Q_1 is operating in

(A) Saturation region

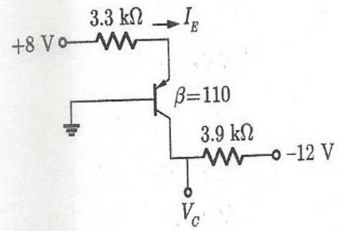
(B) Cut off region

(C) Reverse active region

(D) Forward active region

QUESTION 2.36

For the circuit shown in below, assume that $V_{EB} = 0.7$ V.



What are the value of I_C and V_C respectively ?

(A) 2.89 mA, −0.7 V

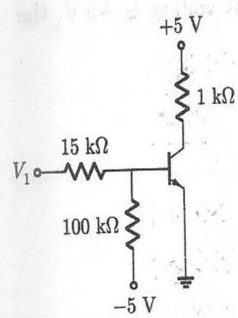
(B) 2.192 m, −3.45 V

(C) 2.89 mA, −3.45 V

(D) 2.192 m, −0.7

QUESTION 2.37

For the transistor shown β = 25. The range of V_1 such that $1.0 \leq V_{CE} \leq 4.5$ is



(A) $1.86 \leq V_1 \leq 3.96$ V

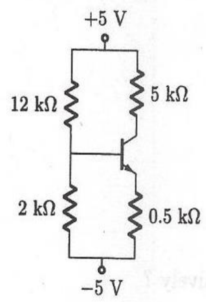
(B) $2.81 \leq V_1 \leq 4.46$ V

(C) $1.43 \leq V_1 \leq 79$ V

(D) $2.18 \leq V_1 \leq 3.69$ V

QUESTION 2.38

The current gain of the transistor shown in the circuit below is $\beta = 100$. The values of Q-point (I_{CQ}, V_{CEQ}) is



(A) (1.8 mA, 2.1 V)

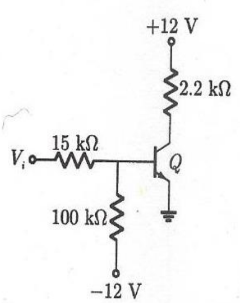
(B) (1.4 mA, 2.3 V)

(C) (1.4 mA, 1.8 V)

(D) (1.8 mA, 1.4 V)

QUESTION 2.39

Consider the circuit shown in figure. If the β of the transistor is 30 and I_{CBO} is 20 mA and the input voltage is +5 V, the transistor would be operating in



(A) saturation region

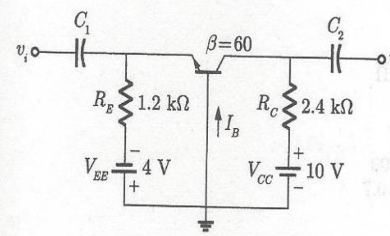
(B) active region

(C) breakdown region

(D) cut-off region

QUESTION 2.40

What is the value of V_{CB} and current I_B for the common base configuration of figure (assume that $V_{BE} = 0.7$ V).



(A) 0.7 V, 64.5 μA

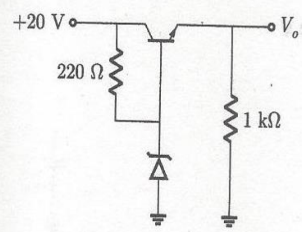
(B) 0.7 V, 45.0 μA

(C) 3.5 V, 2.75 mA

(D) 3.5 V, 45.0 μA

QUESTION 2.41

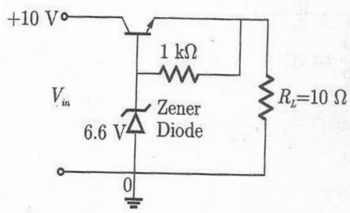
In the regulator circuit shown below $V_Z = 12$ V, $\beta = 50$, $V_{BE} = 0.7$ V. The Zener current is



________ mA

QUESTION 2.42

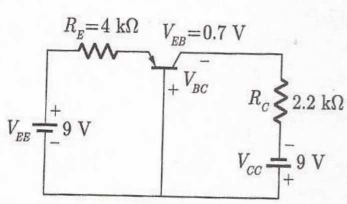
The three-terminal linear voltage regulator is connected to a 10 Ω load resistor as shown in the figure. If V_{in} is 10 V, what is the power dissipated in the transistor ?



_______ Watt

QUESTION 2.43

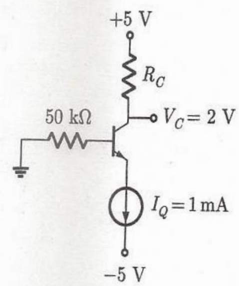
Consider the common-base circuit shown in figure. For the transistor, assume $\alpha = 0.9920$. The value of base-collector voltage (V_{BC}) is



_______ Volt

QUESTION 2.44

The common-emitter current gain of the transistor is $\beta = 75$. The voltage V_{BE} in ON state is 0.7 V. The value of I_C and R_C is



(A) 0.987 mA, 3.04 kΩ

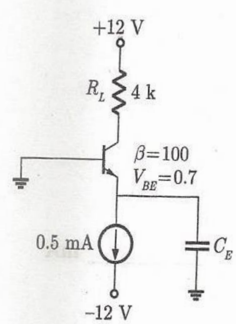
(B) 1.013 mA, 2.96 kΩ

(C) 0.946 mA, 4.18 kΩ

(D) 1.057 mA, 3.96 kΩ

QUESTION 2.45

For the circuit shown in Figure, the transistor used has $\beta = 100$.



The region of operation of the BJT is

(A) Cutoff region

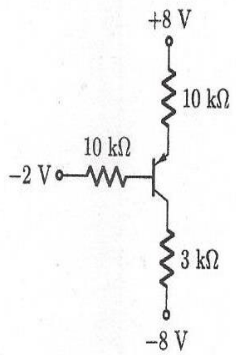
(B) Forward active region

(C) Saturation region

(D) Reverse active region

QUESTION 2.46

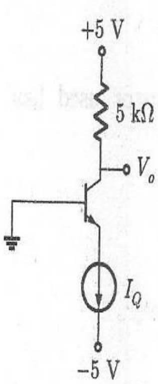
The common-emitter current gain of the transistor is $\beta = 75$. The voltage V_{BE} in ON state is 0.7 V. The value of V_{EC} is



_______ Volt

QUESTION 2.47

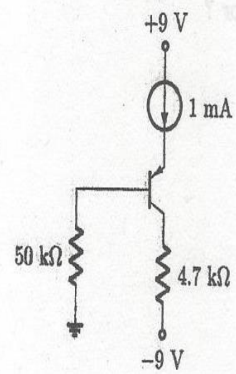
For the given circuit $V_{CB} = 0.5$ V and $\beta = 100$. The value of I_Q is



_______ mA

QUESTION 2.48

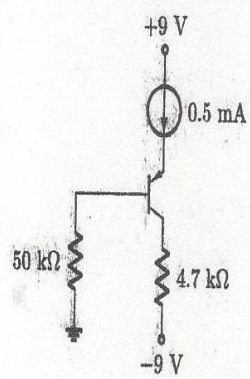
For the given transistor, $\beta = 50$. The value of voltage V_{EC} is



_______ Volt

QUESTION 2.49

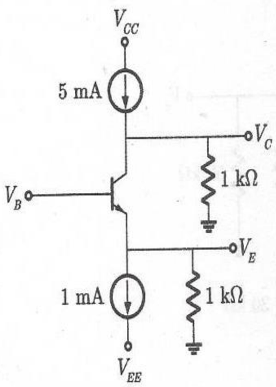
In the given circuit if $\beta = 50$, the power dissipated in the transistor is



_______ mW

QUESTION 2.50

For the transistor circuit shown below, assume $\alpha \simeq 1$ and $V_{BE} = 0.7$ V at the edge of conduction. What are the values of V_E and V_C for $V_B = 0$?



(A) -0.7 V, 4.7 V

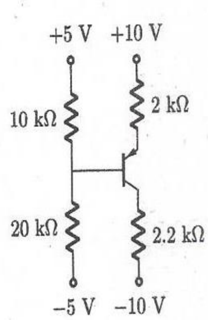
(B) -0.7 V, 5 V

(C) -0.7 V, 5.7 V

(D) -1 V, -0.5 V

QUESTION 2.51

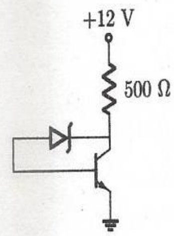
For the circuit shown below, let $\beta = 60$. The value of V_{ECQ} is



______ Volt

QUESTION 2.52

In the circuit shown below Zener voltage is $V_Z = 5$ V and $\beta = 100$. The value of I_{CQ} and V_{CEQ} are



(A) 12.47 mA, 4.3 V

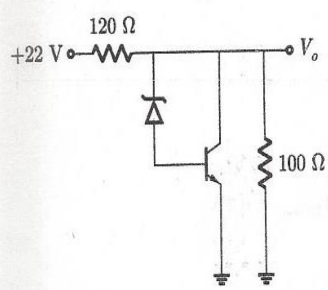
(B) 12.47 mA, 5.7 V

(C) 10.43 A, 5.7 V

(D) 10.43 A, 4.3 V

QUESTION 2.53

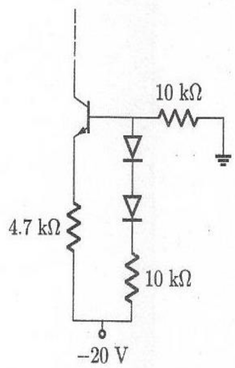
In the shunt regulator shown below, the $V_Z = 8.2$ V and $V_{BE} = 0.7$ V. The regulated output voltage V_o is



______ Volt

QUESTION 2.54

In the bipolar current source of figure shown below, the diode voltage and transistor base-emitter voltage are equal.

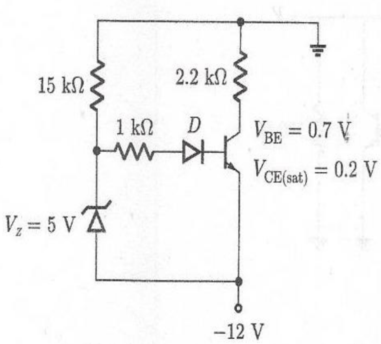


If base current is neglected, then what is collector current ?

_______ mA

QUESTION 2.55

The transistors used in the circuit shown below has $\beta = 30$ and I_{CBO} is negligible.



If the forward voltage drop of diode is 0.7 V, then the current through collector will be

_______ mA

QUESTION 2.56

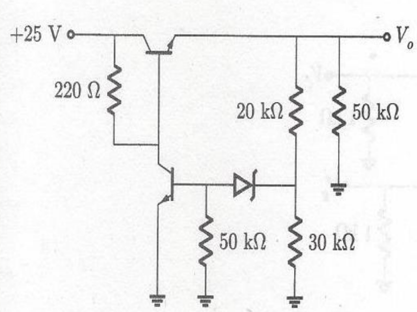
In the series voltage regulator circuit shown below

$V_{BE} = 0.7$ V,

$\beta = 50$,

$V_Z = 8.3$ V

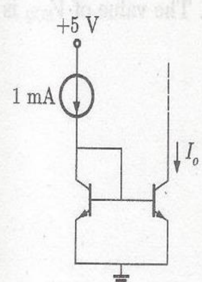
What is the output voltage V_o ?



_______ Volt

QUESTION 2.57

In the current mirror circuit shown below the transistor parameters are $V_{BE} = 0.7$ V, $\beta = 50$ and the Early voltage is infinite. Assume that transistors are matched.

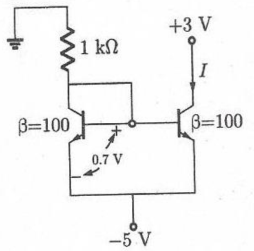


What is the output current I_o ?

_______ μA

QUESTION 2.58

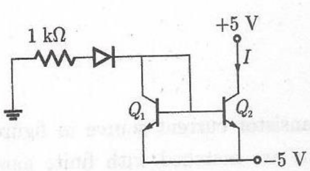
Two perfectly matched silicon transistor are connected as shown in figure. What is the value of the current I ?



_______ mA

QUESTION 2.59

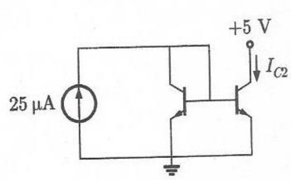
Two perfectly matched silicon transistor are connected as shown in the figure assuming the β of the transistors to be very high and the forward voltage drop in diodes to be 0.7 V, the value of current I is



_______ mA

QUESTION 2.60

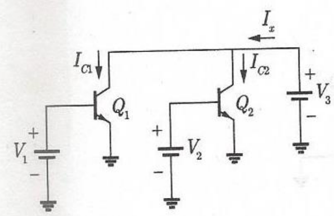
The two transistor in figure below are identical. If $\beta = 25$, the current I_{C2} is



_______ μA.

QUESTION 2.61

In the given circuit, Q_1 and Q_2 are identical and operates in the active mode such that $I_{C1} = 10I_{C2}$ and $V_T = 26$ mV the value of $V_1 - V_2$ is



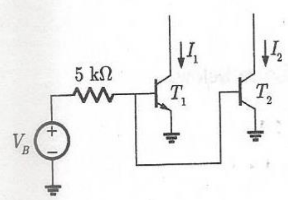
_______ mV

QUESTION 2.62

Consider the circuit shown in figure below, given that

$$I_{S1} = 2I_{S2} = 4 \times 10^{-16} \text{ A},$$
$$\beta_1 = \beta_2 = 100, \text{ and}$$
$$I_1 = 1 \text{ mA}.$$

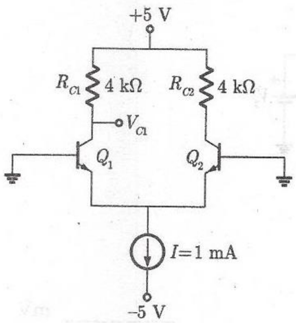
What is the value of V_B voltage ?



_______ mV

QUESTION 2.63

For the circuit shown below in figure, $\beta = 200$ and $V_{BE\,active} = 0.7$ V for each transistor and both transistors are identical.



The value of collector voltage (V_{C1}) of transistor Q_1 is

(A) 1 V

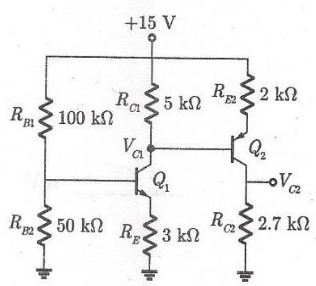
(B) 0.5 V

(C) 3 V

(D) 1.5 V

QUESTION 2.64

Consider the circuit shown in figure below.

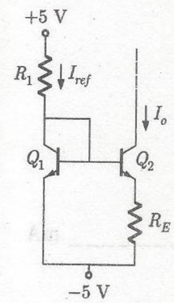


Assume that I_{B2} is negligible then what is the value of voltage V_{C1} and V_{C2} ?

	V_{C1}	V_{C2}
(A)	8.6 V	7.62 V
(B)	7.62 V	8.6 V
(C)	7.90 V	9.62 V
(D)	9.62 V	7.90 V

QUESTION 2.65

Consider the wilder current source shown below. Both of transistor are identical and $\beta >> 1$ and $V_{BE1} = 0.7$ V. The value of resistance R_1 and R_E to produce $I_{ref} = 1$ mA and $I_o = 12\,\mu$A is ($V_t = 0.026$)



(A) 9.3 kΩ, 18.23 kΩ

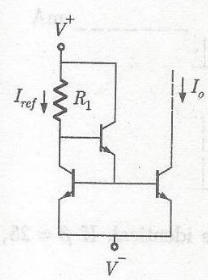
(B) 9.3 kΩ, 9.58 kΩ

(C) 15.4 kΩ, 16.2 kΩ

(D) 15.4 kΩ, 32.4 kΩ

QUESTION 2.66

Consider the base three transistor current source in figure below. Assume all transistor are matched with finite gain and early voltage $V_A = \infty$. The expression for I_o is



(A) $\dfrac{I_{ref}}{1+\frac{2}{1+\beta}}$

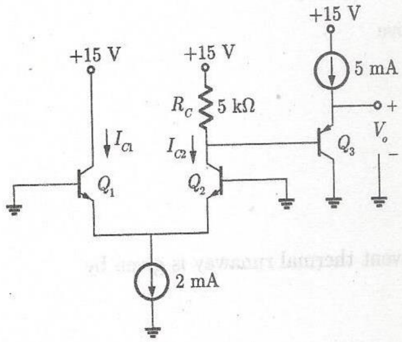
(B) $\dfrac{I_{ref}}{1+\frac{1}{2+\beta}}$

(C) $\dfrac{I_{ref}}{1+\frac{2}{\beta(1+\beta)}}$

(D) $\dfrac{I_{ref}}{1+\frac{1}{\beta(2+\beta)}}$

QUESTION 2.67

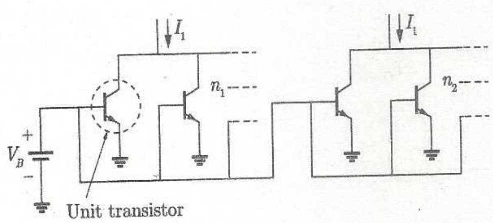
In the circuit shown below assume that the transistors Q_1 and Q_2 have identical characteristics. All of the transistor operate in active region and $\beta = 100$. The value of output voltage V_o is



________ Volt

QUESTION 2.68

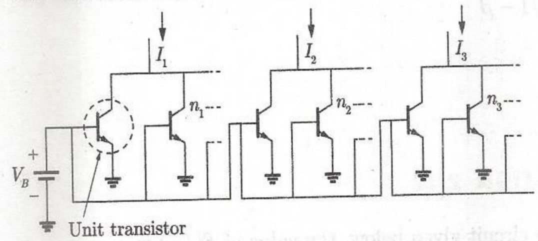
An integrated circuit requires two current sources $I_1 = 1\,\text{mA}$, and $I_2 = 1.5\,\text{mA}$. Assuming that only integer multiple of a bipolar transistor having $I_S = 3 \times 10^{-16}$ A can be placed in parallel, and only a single voltage source V_B is available, the minimum number of unit transistors required for the circuit are



	n_1	n_2
(A)	2	2
(B)	3	3
(C)	2	3
(D)	3	2

QUESTION 2.69

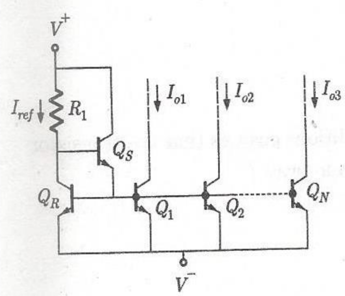
An integrated circuit requires three current sources; $I_1 = 0.2\,\text{mA}$, $I_2 = 0.3\,\text{mA}$ and $I_3 = 0.45\,\text{mA}$. Assuming that only integer multiples of a unit bipolar transistor having $I_S = 3 \times 10^{-16}$ Amp can be placed in parallel, and only a single voltage source V_B is available, the minimum number of unit transistor required for the circuit are



	n_1	n_2	n_3
(A)	1	2	3
(B)	2	3	4.5
(C)	4	6	9
(D)	8	12	18

QUESTION 2.70

All transistor in the N output mirror shown below are matched with a finite gain β and early voltage $V_A = \infty$. The expression for each load current is



(A) $\dfrac{I_{ref}}{1+\frac{1+N}{\beta(\beta+1)}}$

(B) $\dfrac{I_{ref}}{1+\frac{N}{\beta+1}}$

(C) $\dfrac{\beta I_{ref}}{1+\frac{1+N}{\beta+1}}$

(D) $\dfrac{\beta I_{ref}}{1+\frac{N}{\beta+1}}$

QUESTION 2.71

The stability factor of a fixed bias is

(A) $1+\beta$

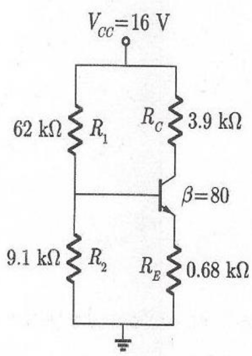
(B) $1-\beta$

(C) $\beta/1-\beta$

(D) $1/1-\beta$

QUESTION 2.72

For the circuit given below, the value of $S(I_{CO})$ is



QUESTION 2.73

Which of the following conditions ensures that the transistor does not undergo thermal run-away ?

(A) $V_{CE}=V_{CC}/2$

(B) $V_{CE}<V_{CC}/2$

(C) $V_{CE}<V_{CC}$

(D) $V_{CE}>V_{CC}/2$

QUESTION 2.74

Stability factor 'S' is approximately unity for

(A) Collector to base bias

(B) Fixed bias

(C) Self bias

(D) none of the above

QUESTION 2.75

The condition to prevent thermal runaway is given by

(A) $\dfrac{\partial P_C}{\partial T_j}<\theta$

(B) $\dfrac{\partial T_j}{\partial P_C}<\dfrac{1}{\theta}$

(C) $\dfrac{\partial P_C}{\partial T_j}<\dfrac{1}{\theta}$

(D) None of these

****

UNACADEMY

Answer

2.1	A
2.2	B
2.3	A
2.4	C
2.5	B
2.6	1.19
2.7	C
2.8	C
2.9	D
2.10	4.67V
2.11	0.496
2.12	B
2.13	B
2.14	A
2.15	1.49
2.16	D
2.17	4.69
2.18	755
2.19	828
2.20	0.2
2.21	B
2.22	B
2.23	C
2.24	A
2.25	C
2.26	B
2.27	C
2.28	0.76
2.29	0.968
2.30	4.47
2.31	3.97
2.32	4.67
2.33	1041
2.34	3.4

2.35	D
2.36	B
2.37	A
2.38	B
2.39	B
2.40	D
2.41	36.17
2.42	2.4
2.43	4.47
2.44	A
2.45	B
2.46	4.1
2.47	0.909
2.48	6.07
2.49	3.87
2.50	A
2.51	4.94
2.52	B
2.53	8.9
2.54	2.32
2.55	5.36
2.56	15
2.57	962
2.58	4.3
2.59	3.6
2.60	23.2
2.61	59.86
2.62	817
2.63	C
2.64	A
2.65	B
2.66	C
2.67	11
2.68	C

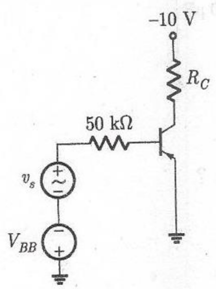
2.69	C
2.70	A
2.71	A
2.72	11.08
2.73	B
2.74	C
2.75	C

CHAPTER 3

BJT AMPLIFIERS

QUESTION 3.1

Consider the circuit shown below. The transistor parameter are $\beta = 100$ and $V_A = \infty$.($V_{\text{thermal}} = 25.9$ mV)



If Q-point is in the center of the load line and $I_{CQ} = 0.5$ mA, the values of R_C and V_{BB} are

(A) 10 kΩ, 0.95 V

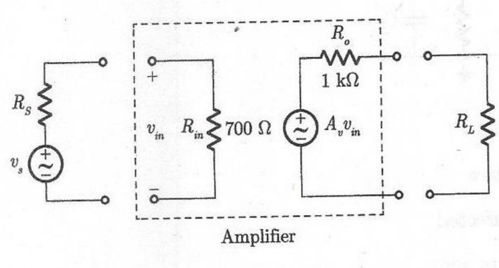
(B) 10 kΩ, 1.45 V

(C) 48 kΩ, 0.95 V

(D) 48 kΩ, 1.45 V

QUESTION 3.2

Consider the amplifier circuit shown in figure below.



Amplifier

When no load is connected, the voltage gain of amplifier is $A_v = 20$. A voltage source $v_s = 10$ mV peak to peak and source resistance $R_S = 600\ \Omega$ is connected. When a 1 kΩ load resistance is connected to the amplifier output, the value of output voltage v_o is

_______ mV

QUESTION 3.3

Given that $h_{fe} = 50$, $h_{ie} = 0.83$ kΩ, for a transistor in CB configuration. The value of h_{fb} and h_{ib} are respectively

(A) 453.5 Ω, –50

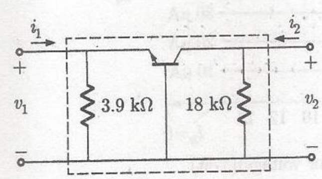
(B) –0.50, 453.5 Ω

(C) 16.27 Ω, –0.98

(D) –0.98, 16.27 Ω

QUESTION 3.4

The common-base amplifier is drawn as a two-port in figure shown below. The parameters are $\beta = 100$, $g_m = 3$ mS, and $r_o = 800$ kΩ.



The h-parameter h_{21} is

(A) 2.46

(B) 0.9

(C) 0.5

(D) 0.67

QUESTION 3.5

In previous question the h-parameter h_{12} is

(A) 3.8×10^{-4}

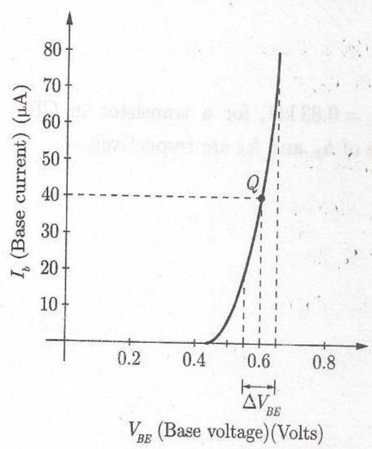
(B) 4.83×10^{-3}

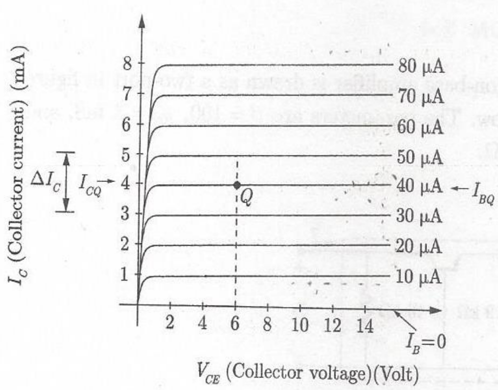
(C) 3.8×10^{4}

(D) 4.83×10^{3}

QUESTION 3.6

Consider the input and output characteristic shown below. The operation point Q is indicated in the graph.





What is the value of h_{ie} and h_{fe} respectively ?

(A) 100, 1.25 MΩ

(B) 1.25 MΩ, 100

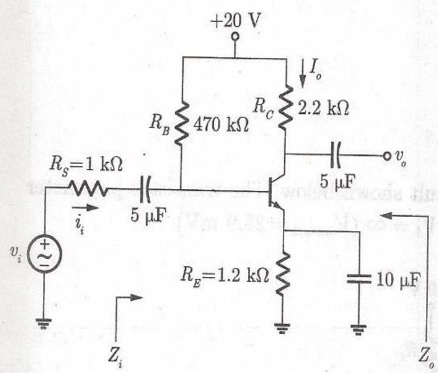
(C) 1.25 kΩ, 500

(D) 1.25 kΩ, 100

QUESTION 3.7

The transistor shown in amplifier circuit has the following h-parameters:

$h_{fe} = 140$, $h_{ie} = 0.86\ \text{k}\Omega$, $h_{re} = 1.5 \times 10^{-4}$, $h_{oe} = 25\ \mu\text{s}$



What is the value of input impedance z_i ?

(A) 8.148 kΩ

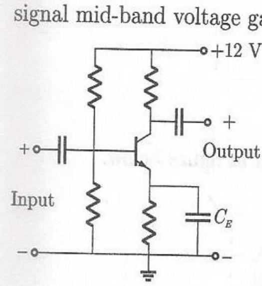
(B) 42.93 Ω

(C) 814.8 Ω

(D) None of the above

QUESTION 3.8

In the single-stage transistor amplifier circuit shown in Figure, the capacitor C_E is removed. Then, the ac small-signal mid-band voltage gain of the amplifier



(A) increase

(B) decreases

(C) is unaffected

(D) drops to zero

QUESTION 3.9

If the dc emitter current in a transistor amplifier is 4 mA, the approximate value of r_e is

(A) 4 Ω

(B) 6.25 Ω

(C) 22 Ω

(D) 26 Ω

QUESTION 3.10

If the transistor parameters are $\beta = 180$ and early voltage $V_A = 140$ V and it is biased at $I_{CQ} = 2$ mA, $V_{\text{thermal}} = 25.9$ mV the value of hybrid-π parameter g_m, r_π and r_o are respectively.

(A) 14 A/V, 2.33 kΩ, 90 kΩ

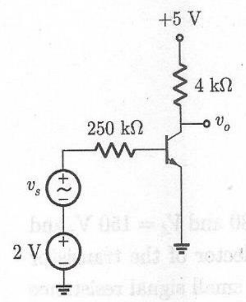
(B) 14 A/V, 90 kΩ, 233 kΩ

(C) 77 mA/V, 2.33 kΩ, 70 kΩ

(D) 77.2 mA/V, 2.33 kΩ, 70 kΩ

QUESTION 3.11

Consider the circuit shown below. The transistor parameters are $\beta = 120$ and $V_A = \infty$. ($V_{\text{thermal}} = 0.0259$ V)



The hybrid-π parameter values of g_m, r_π and r_o are

(A) 24 mA/V, ∞, 5 kΩ

(B) 24 mA/V, 5 kΩ, ∞

(C) 48 mA/V, 10 kΩ, 18.4 kΩ

(D) 48 mA/V, 18.4 kΩ, 10 kΩ

QUESTION 3.12

The nominal quiescent collector current of a transistor is 1.2 mA. If the range of β for this transistor is $80 \le \beta \le 120$ and if the quiescent collector current changes by ± 10 percent, the range in value for r_π is

(A) 1.73 kΩ $< r_\pi <$ 2.59 kΩ

(B) 1.93 kΩ $< r_\pi <$ 2.59 kΩ

(C) 1.73 kΩ $< r_\pi <$ 2.59 kΩ

(D) 1.56 kΩ $< r_\pi <$ 2.88 kΩ

QUESTION 3.13

A transistor with $\beta = 120$ is biased with a collector current $I_C = 1.2$ mA. Values of g_m, r_π and r_e respectively are, ($V_{\text{thermal}} = 25$ mV)

(A) 48 mA/V, 20.6 Ω, 2.5 kΩ

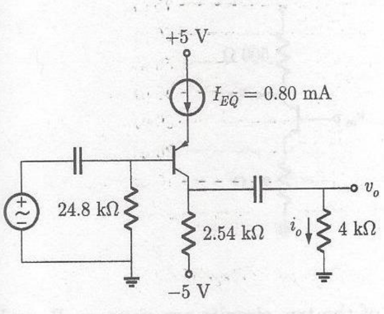
(B) 48 mA/V, 2.5 kΩ, 20.6 Ω

(C) 20.83 mA/V, 20.6 Ω, 2.5 kΩ

(D) 20.83 mA/V, 2.5 kΩ, 20.6 Ω

QUESTION 3.14

In the given circuit, transistor has $\beta = 65$ and $V_A = 75$ V



The transistor parameters r_π and r_o are

(A) 2.14 kΩ, 82.48 kΩ

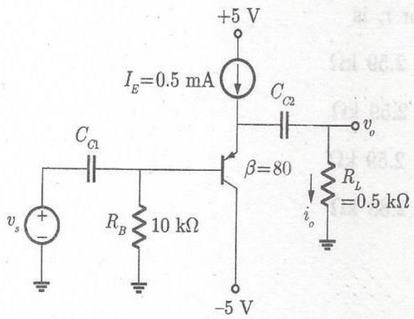
(B) 2.14 kΩ, 95.2 kΩ

(C) 200 kΩ, 1 kΩ

(D) 214 kΩ, 952 kΩ

QUESTION 3.15

For the transistor amplifier circuit shown below $V_A = 150$ V, $\beta = 80$, $V_{BEon} = 0.7$ V, $V_{\text{thermal}} = 26$ mV



What is the value of transconductance g_m, hybrid-π parameter r_π and r_o respectively ?

(A) 19 mA/V, 304 kΩ, 4.21 kΩ

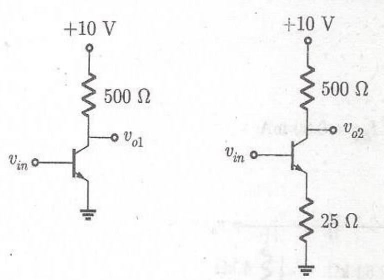
(B) 19 mA/V, 4.21 kΩ, 304 kΩ

(C) 19 mA/V, 304 kΩ, 52.26 Ω

(D) 52.26 A/V, 0.5 kΩ, 4.21 kΩ

QUESTION 3.16

The transistor following amplifiers circuits has parameters $\beta = 100$, $r_\pi = 2.5$ kΩ.



If input impedances of the two circuits are given as R_1 and R_2 respectively then

(A) $R_1 = 2.5$ kΩ, $R_2 = 2.5$ kΩ

(B) $R_1 = 2.5$ kΩ, $R_2 = 5$ kΩ

(C) $R_1 = 500$ kΩ, $R_2 = 50\ \Omega$

(D) $R_1 = 50\ \Omega$, $R_2 = 500\ \Omega$

QUESTION 3.17

In previous question, ratio of voltage gain A_{v1}/A_{v2} for the two circuits is

(A) 2

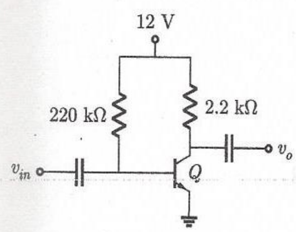
(B) 0.5

(C) 4

(D) 0.5

QUESTION 3.18

The transistor in BJT amplifier circuit shown below has $\beta = 60$, $r_o = 20$ kΩ, $V_{\text{thermal}} = 26$ mV.



The value of output impedance and voltage gain are

(A) 1.98 kΩ, −238.27

(B) 20 kΩ, −238.27

(C) 22.2 kΩ, − 23.82

(D) 2.2 kΩ, − 23.82

QUESTION 3.19

For a transistor, parameters are $\beta = 180$ and $V_A = 150$ V, and it is biased at $I_{CQ} = 2$ mA. If the collector of the transistor is connected to the base terminal, the small signal resistance $r_e = v_{ce}/i_c$ (in kΩ) of the two-terminal device is

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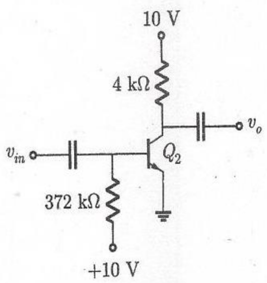
QUESTION 3.20

Consider an amplifier circuit shown below. Transistor parameters are given as $\beta = 100$ and $V_{\text{thermal}} = 25$ mV.



The input impedance and voltage gain respectively are

(A) 0.99 kΩ, 200

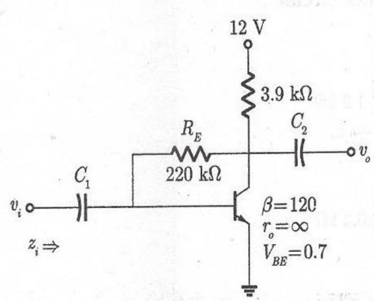
(B) 390 kΩ, 200

(C) 0.99 kΩ, −400

(D) 390 kΩ, 400

QUESTION 3.21

For the collector feedback configuration of figure shown below, $V_{\text{thermal}} = 26$ mV.



The value of voltage gain $A_v = \frac{v_o}{v_i}$ and input impedance z_i is

(A) −2.42, 1.578 kΩ

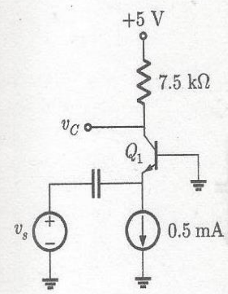
(B) −2.42, 509 Ω

(C) −291.41, 1.578 kΩ

(D) −291.41, 509.4 Ω

QUESTION 3.22

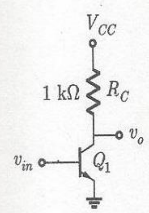
Consider the amplifier circuit shown below. What is the voltage gain $A_v = \frac{v_C}{v_s}$ of the given amplifier circuit ? ($V_{\text{thermal}} = 25$ mV)



QUESTION 3.23

A bipolar amplifier circuit shown below exhibits the following characteristic

$$I_C = I_s \exp\left(\frac{V_{BE}}{2V_T}\right),\ V_T = 25 \text{ mV}$$

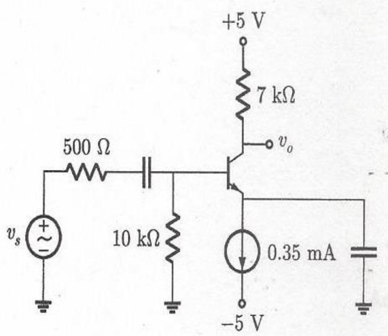


If there is no early effect, then voltage gain of the amplifier for a bias current $I_C = 1$ mA is

----

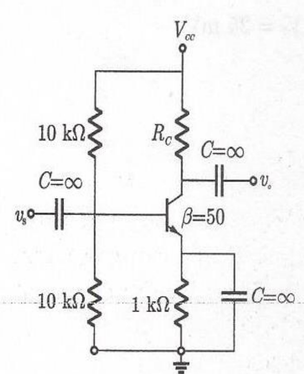
QUESTION 3.24

The parameters of the transistor in the circuit shown below are $\beta = 100$ and $V_A = 100$ V. What will be the small-signal voltage gain $A_v = v_o / v_s$ for the circuit ?



QUESTION 3.25

The transconductance g_m of the transistor shown in figure is 10 mS. The value of the input resistance R_{in} is



(A) 10.0 kΩ

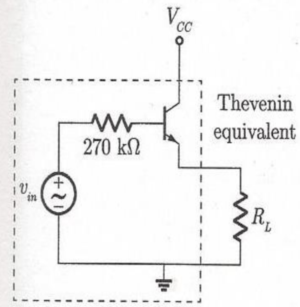
(B) 8.3 kΩ

(C) 5.0 kΩ

(D) 2.5 kΩ

QUESTION 3.26

Consider the amplifier circuit shown below the parameter are $g_m = 2$ ms, $\beta = 100$ $r_o = 250\,\text{k}\Omega$. Figure shows the thevenin equivalent faced by load resistance R_L.



Thevenin voltage V_{th} is

(A) $10v_i$

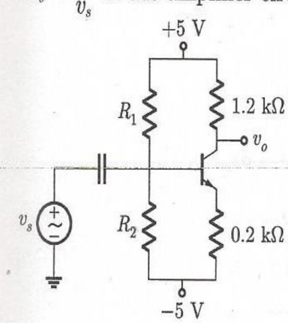
(B) $90v_i$

(C) v_i

(D) None of the above

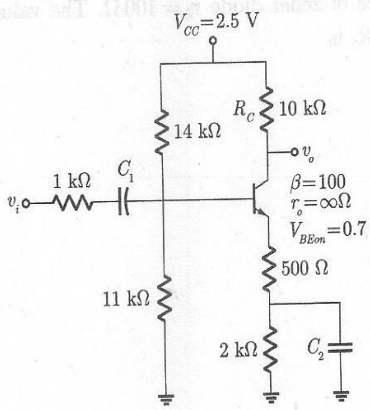
QUESTION 3.27

In the given circuit the Q-point is in the centre of the load line. The transistor parameters are $\beta = 150$ and $V_A = \infty$. ($V_{\text{thermal}} = 25.9\,\text{mV}$). What is the small-signal voltage gain $A_v = \frac{v_o}{v_s}$ of the amplifier circuit ?



QUESTION 3.28

Consider the circuit shown below, $V_{thermal} = 26$ mV

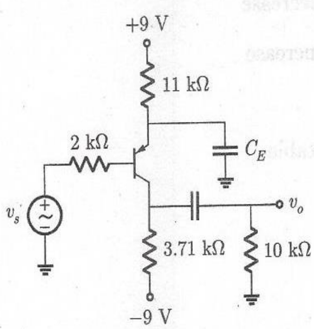


What is the value of voltage gain $A_v = \frac{v_o}{v_i}$?

____

QUESTION 3.29

In the circuit shown below, $\beta = 80$ and $V_A = \infty$.



The signal voltage gain $A_v = \frac{v_o}{v_s}$ is

(A) −166.23

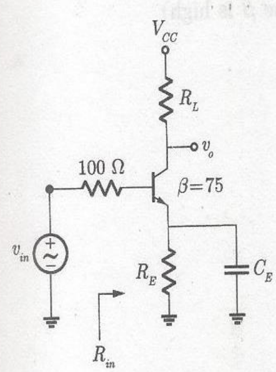
(B) −47.5

(C) −61.7

(D) −114

QUESTION 3.30

Consider the Amplifier circuit shown below, $V_{thermal} = 26$ mV



Assume that $R_E = 0$. Given that small signal voltage gain

$$A_v = \frac{v_o}{v_{in}} = -10$$

and input impedance $R_{in} = 500$ kΩ. What is the value of I_C (Collector current) and load resistance R_L ?

(A) 66.67 μAmp, 3.9 kΩ

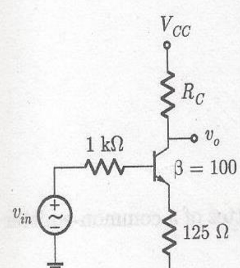
(B) 3.9 μAmp, 66.67 kΩ

(C) 3.9 μAmp, 500 kΩ

(D) 5.2 μAmp, 66.67 kΩ

QUESTION 3.31

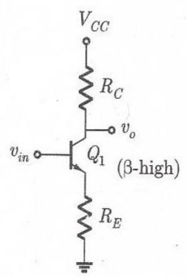
Consider the transistor amplifier circuit shown in figure below. Given that $\beta = 100$, $V_{thermal} = 25$ mV and voltage gain $|A_v| = 20$. If the transistor is biased with collector current $I_C = 1$ mA, then value of R_C is



_______ kΩ

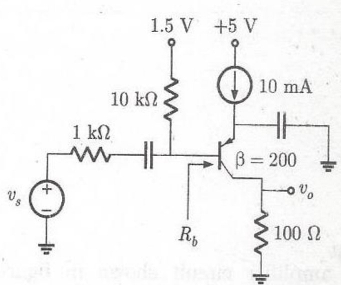
QUESTION 3.32

In the following circuit, voltage drop across R_C and R_E are $20V_T$ and $4V_T$ respectively. What is the voltage gain of circuit ? (V_T is thermal voltage, assume β is high)



QUESTION 3.33

In the given circuit, impedance R_b seen through base of the transistor is



_______ Ω

QUESTION 3.34

If a resistor is introduced in the emitter of a common-emitter (CE) amplifier then

(A) both input impedance and voltage gain increases

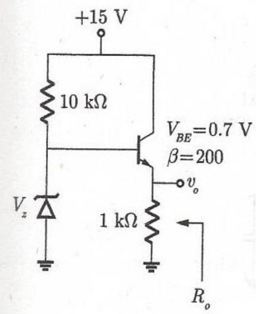
(B) input impedances increases and voltage gain decreases

(C) input impedances decreases and voltage gain increases

(D) both input impedances and voltage gain decreases

QUESTION 3.35

Consider the voltage reference circuit shown below. The zener diode parameter has V_z (zener voltage 5.6 V) and dynamic small signal resistance of zener diode $r_d = 100\,\Omega$. The value of output resistance R_o is



_______ Ω

QUESTION 3.36

In a common emitter amplifier, the voltage gain = 90. If the emitter bypass capacitor is removed

(A) the voltage gain will decrease

(B) the voltage gain will increase

(C) the Q-point will shift

(D) the circuit will be unstable

QUESTION 3.37

An amplifier has good voltage, current and power gains and the input resistance is low. It is a

(A) common base

(B) common emitter

(C) common collector amplifier

(D) None

QUESTION 3.38

In a self bias circuit for CE amplifier, the base voltage is

(A) equal to supply voltage

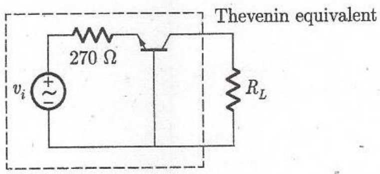
(B) more than supply voltage

(C) equal to or more than supply voltage

(D) less than supply voltage

QUESTION 3.39

Consider the common Base amplifier shown below. The parameters are $g_m = 2$ mS and $r_o = 250$ kΩ. Figure shows the Thevenin equivalent faced by load resistance R_L.



Thevenin voltage v_{TH} is

(A) $263v_i$

(B) $132v_i$

(C) $346v_i$

(D) $498v_i$

QUESTION 3.40

In previous question Thevenin equivalent resistance R_{TH} is

(A) 384 kΩ

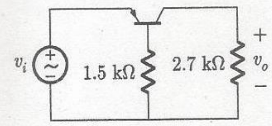
(B) 697 kΩ

(C) 408 kΩ

(D) 915 kΩ

QUESTION 3.41

In the common-base stage of figure shown below, $I_{CQ} = 1$ mA and $\beta = 75$. The input resistance is



_______ Ω

QUESTION 3.42

For an amplifier, the current gain ≅ 1, power gain = voltage gain, input resistance is very low (≅ r_e) and output resistance ≅ R_C. The amplifier is

(A) common base

(B) common emitter

(C) common collector

(D) Darlington pair

QUESTION 3.43

The Early voltage of a BJT is $V_A = 75$ V. The minimum required collector current such that the output resistance is at least $r_o = 200$ kΩ, is

_______ mA

QUESTION 3.44

Which of the following amplifiers is known as an emitter follower ?

(A) CE amplifier

(B) CC amplifier

(C) CB amplifier

(D) Cascode amplifier

QUESTION 3.45

Which of the following amplifiers is used in impedance matching ?

(A) CB amplifier

(B) CC amplifier

(C) CE amplifier

(D) Cascode amplifier

QUESTION 3.46

For an amplifier, the input resistance is high, the current gain is high and voltage gain is near unity. It is a

(A) common base

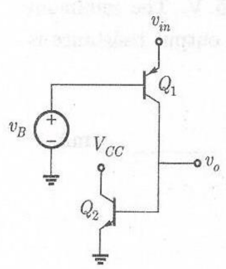
(B) common emitter

(C) common collector

(D) Darlington amplifier

QUESTION 3.47

The transistor parameters of Q_1 and Q_2 of circuit shown in fig are $(g_{m1}, r_{\pi 1})$ and $(g_{m2}, r_{\pi 2})$ respectively.



The Voltage gain $|A_v|$ of the following circuit is

(A) $g_{m1} r_{\pi 1}$

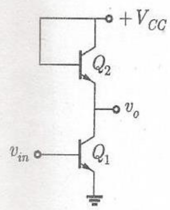
(B) $g_{m2} r_{\pi 1}$

(C) $g_{m1} r_{\pi 2}$

(D) $g_{m2} r_{\pi 2}$

QUESTION 3.48

Consider an amplifier circuit shown in figure. If the transistors Q_1 and Q_2 has parameters $g_{m1}, r_{\pi 1}$ and $g_{m2}, r_{\pi 2}$ respectively, then voltage gain $|A_v|$ is



(A) $\dfrac{g_{m1} r_{\pi 2}}{1 + g_{m2} r_{\pi 2}}$

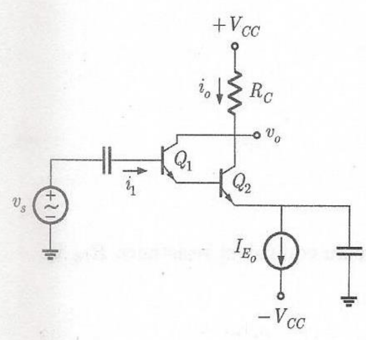
(B) $\dfrac{g_{m2} r_{\pi 2}}{1 + g_{m2} r_{\pi 2}}$

(C) $\dfrac{g_{m1} r_{\pi 1}}{g_{m2} r_{\pi 2}}$

(D) $\dfrac{g_{m1} r_{\pi 1}}{1 + g_{m2} r_{\pi 2}}$

QUESTION 3.49

In the given Darlington pair circuit of figure shown below, transistor Q_1 and Q_2 parameters are $\beta_1, r_{\pi 1}$ and $\beta_2, r_{\pi 2}$ respectively,



The current gain $A_i = \frac{i_o}{i_1}$ of the circuit is

(A) $\beta_1 \beta_2$

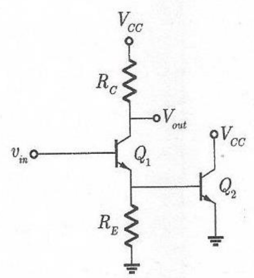
(B) $\beta_1 + \beta_2$

(C) $\beta_1 + \beta_2 + \beta_1 \beta_2$

(D) $\beta_1 + \beta_2 - \beta_1 \beta_2$

QUESTION 3.50

For the circuit shown below, the value of voltage gain $A_v = \frac{v_o}{v_i}$ is



(A) $-\frac{R_C}{1/g_{m1} + R_E || r_{\pi 1}}$

(B) $-\frac{R_C}{1/g_{m1} + R_E || r_{\pi 2}}$

(C) $-\frac{R_C}{1/g_{m2} + R_E || r_{\pi 2}}$

(D) $-\frac{R_C}{1/g_{m2} + R_E || r_{\pi 1}}$

QUESTION 3.51

A cascode amplifier comprises

(A) CB and CC amplifier

(B) CB and CE amplifier

(C) CE and CB amplifier

(D) CC and CE amplifier

QUESTION 3.52

A transistor amplifier circuit parameter at $I_C = 2\,\text{mA}$ has internal capacitance C_μ (emitter-base capacitance) $= 1\,\text{pF}$ and C_π (emitter-base capacitance) $= 10\,\text{pF}$ and $\beta = 150$, $V_T = 25\,\text{mV}$. The value of f_T (unity gain frequency) and f_B (3-dB frequency) are respectively

(A) 4.24 GHz, 28.26 MHz

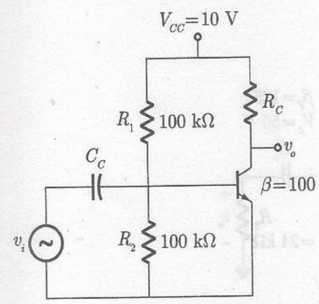
(B) 28.26 GHz, 4.24 GHz

(C) 4.24 MHz, 14.13 MHz

(D) 14.13 MHz, 4.24 GHz

QUESTION 3.53

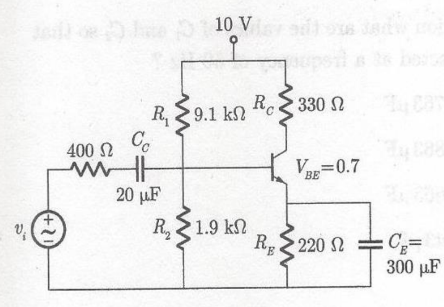
Consider the amplifier circuit shown below. Given that h-parameter $h_{ie} = -1\,\text{k}\Omega$. For a lower 3 dB frequency of 10 Hz, what is the required value of C_C ?



_______ μF

QUESTION 3.54

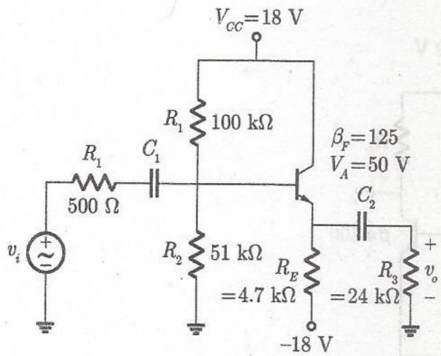
Consider the amplifier circuit shown in figure below. The circuit has π-model parameter $r_\pi = 0.245\,\text{k}\Omega$ and $V_{\text{thermal}} = 26\,\text{mV}$. What is the value of 3 dB frequency f_l of the amplifier due to coupling capacitor C_C ?



_______ Hz

QUESTION 3.55

Consider the amplifier circuit shown below having $V_{\text{thermal}} = 25\,\text{mV}$.



What is value of collector current, I_C and hybrid parameter, r_π respectively ?

(A) $37.3\,\mu\text{A},\ 669\,\Omega$

(B) $4.67\,\mu\text{A},\ 5.35\,\Omega$

(C) $1.13\,\text{mA},\ 5.35\,\text{k}\Omega$

(D) $4.67\,\text{mA},\ 669\,\Omega$

QUESTION 3.56

In previous question what are the values of C_1 and C_2 so that they can be neglected at a frequency of 50 Hz ?

(A) $0.105\,\mu\text{F},\ 0.763\,\mu\text{F}$

(B) $0.005\,\mu\text{F},\ 0.863\,\mu\text{F}$

(C) $0.505\,\mu\text{F},\ 0.663\,\mu\text{F}$

(D) $0.53\,\mu\text{F},\ 0.343\,\mu\text{F}$

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UNACADEMY

Answer

3.1	A
3.2	53.84
3.3	D
3.4	B
3.5	A
3.6	B
3.7	C
3.8	B
3.9	B
3.10	D
3.11	B
3.12	D
3.13	B
3.14	B
3.15	B
3.16	B
3.17	A
3.18	A
3.19	12.88
3.20	C
3.21	D
3.22	150
3.23	20
3.24	-80
3.25	D
3.26	C
3.27	-5.75
3.28	-12.82

3.29	B
3.30	B
3.31	3.2
3.32	-4
3.33	502
3.34	B
3.35	5.74
3.36	A
3.37	B
3.38	D
3.39	D
3.40	A
3.41	45
3.42	A
3.43	0.375
3.44	B
3.45	B
3.46	C
3.47	C
3.48	A
3.49	C
3.50	B
3.51	C
3.52	A
3.53	16
3.54	13
3.55	D
3.56	C