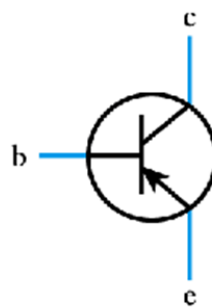


1) Which terminal represents the control input of a bipolar transistor?

- a) The gate
- b) The collector
- c) The base
- d) The emitter

2) What kind of device does the following symbol represent?



- a) An *npn* bipolar transistor.
- b) An *n*-channel JFET.
- c) A *pnp* bipolar transistor.
- d) A *p*-channel JFET.

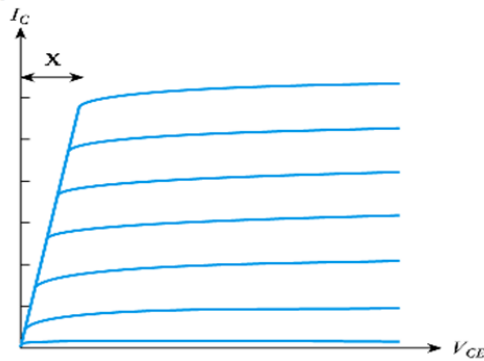
3) Which of the following expressions represents the DC current gain of a bipolar transistor?

- a)  $dI_C / dI_B$
- b)  $I_C / I_B$
- c)  $dI_C / dV_{BE}$
- d)  $I_C / V_{BE}$

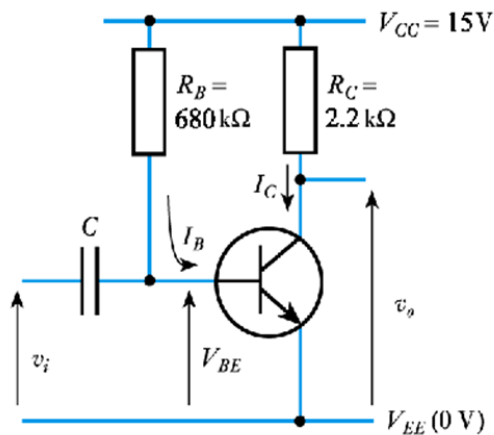
4) Which of the following expressions represents the transconductance of a bipolar transistor?

- a)  $I_C / V_{BE}$
- b)  $dI_C / dV_{BE}$
- c)  $I_C / I_B$
- d)  $dI_C / dI_B$

- 5) In the bipolar transistor output characteristics shown below, what region is represented by the symbol 'X'?

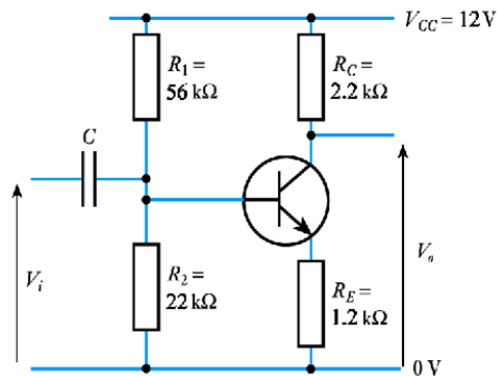


- a) The active region  
 b) The space-charge region  
 c) The saturation region  
 d) The ohmic region
- 6) Determine the quiescent collector current of the following circuit, given that the  $h_{FE}$  of the transistor is 150.



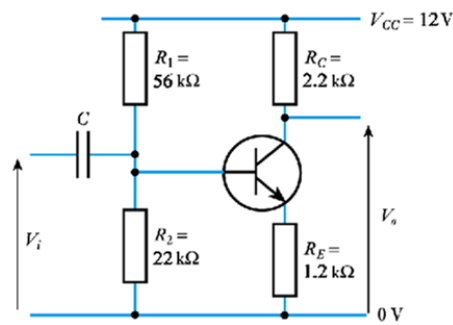
- a) 1.15 mA  
 b) 2.1 mA  
 c) 3.15 mA  
 d) 5.3 mA

7) Determine the quiescent output voltage of the following circuit.



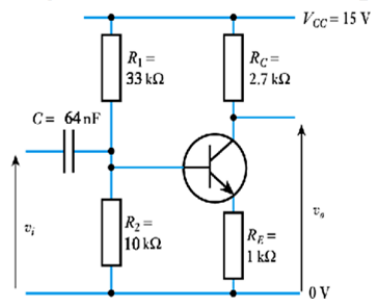
- a) 4.3 V
- b) 4.8 V
- c) 5.6 V
- d) 7.1 V

8) What is the small-signal voltage gain of the circuit given in the last question?



- a) -1.83
- b) -2.2
- c) -2.56
- d) -2.83

9) Determine the low-frequency cut-off of the following circuit.



- a) 75 Hz
- b) 250 Hz
- c) 324 Hz
- d) 2036 Hz



17) Combinations of conductors and components that form loops within a circuit act as electric dipoles.

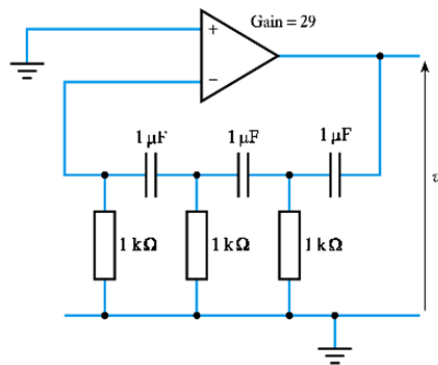
a) True

b) False

18) Which of the following is not an appropriate design method for tackling EMC related problems?

- a) Routing noise sensitive signals around the outside of a printed circuit board to keep them away from other signals.
- b) Minimise the area of any loops formed.
- c) Use multilayer boards to reduce coupling between circuits.
- d) Minimise track lengths.

19) Calculate the frequency of oscillation of the phase-shift oscillator shown here.



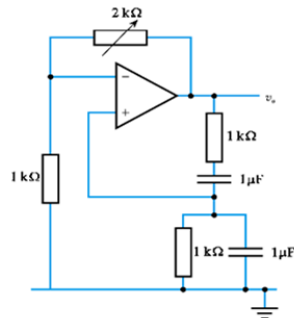
a) 26 Hz.

b) 65 Hz.

c) 135 Hz.

d) 238 Hz.

20) Calculate the frequency of oscillation of the Wien-bridge oscillator shown here.



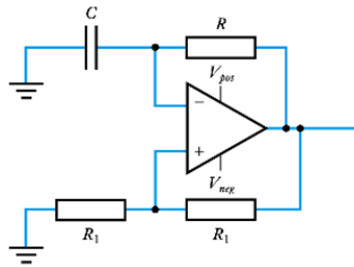
a) 159 Hz.

b) 238 Hz.

c) 327 Hz.

d) 424 Hz.

21) What is the maximum positive output voltage of the relaxation oscillator shown here?



- a)  $V_{pos}$                       b)  $V_{pos}/2$                       c)  $V_{pos}/4$                       d)  $(C/R)V_{pos}$

22) Crystals have two resonant frequencies.

- a) True                                      b) False

23) What elements are found within the equivalent circuit of a crystal?

- a) Resistance alone.                      b) Resistance and capacitance.  
c) Resistance and inductance.                      d) Resistance, capacitance and inductance.

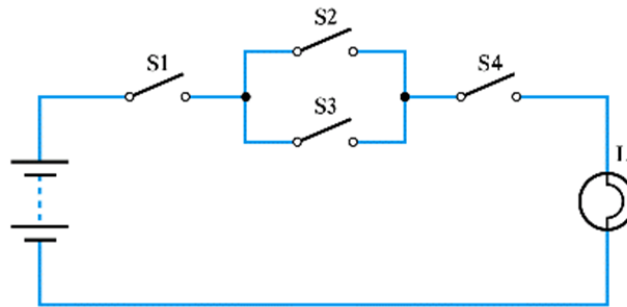
24) In order to ensure stability in a circuit, the designer must ensure that the phase shift reaches 180 degrees before the gain falls to unity.

- a) True                                      b) False

25) What is the name given to the amount (in dB) by which the loop gain is less than 0 dB when the phase reaches 180 degrees?

- a) The gain margin.                      b) The transition point.  
c) The zero-gain bandwidth.                      d) The phase margin.

26) What logic function corresponds to the following arrangement?



- a)  $L = S1 \text{ AND } (S2 \text{ OR } S3) \text{ AND } S4$ .
- b)  $L = S1 \text{ OR } (S2 \text{ AND } S3) \text{ OR } S4$ .
- c)  $L = (S1 \text{ OR } S2) \text{ AND } (S3 \text{ OR } S4)$ .
- d)  $L = (S1 \text{ AND } S2) \text{ OR } (S3 \text{ AND } S4)$ .

27) Which logic gate has the following truth table?

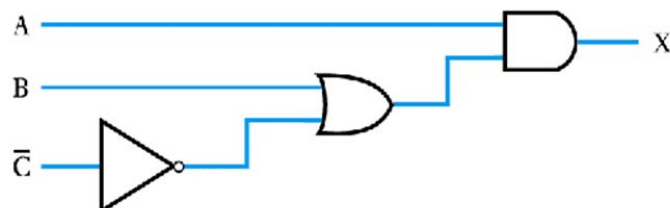
A	B	C
0	0	0
0	1	1
1	0	1
1	1	1

- a) A two-input AND gate.
- b) An exclusive OR gate.
- c) An exclusive NOR gate.
- d) A two-input OR gate.

28) In Boolean algebra the AND function is represented by the '+' sign.

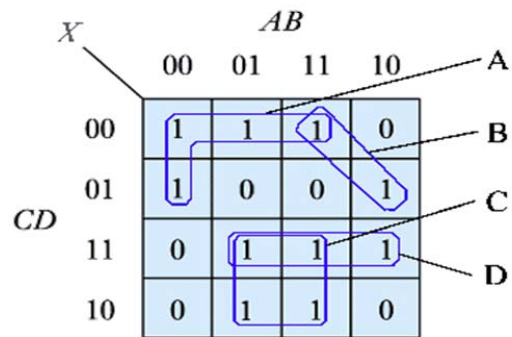
- a) True
- b) False

29) What Boolean expression describes the output X of this arrangement?



- a)  $X = A + B + C$
- b)  $X = A \cdot (B + C)$
- c)  $X = (A \cdot B) + C$
- d)  $X = A + (B \cdot C)$

30) In the Karnaugh map shown below, which of the loops shown represents a legal grouping?



A)

B)

C)

D)