Q .1: Power factor of a linear circuit is defined as the:

a. Ratio of real power to reactive power

b. Ratio of real power to apparent power

c. Ratio of reactive power to apparent power

d. Ratio of resistance to inductance

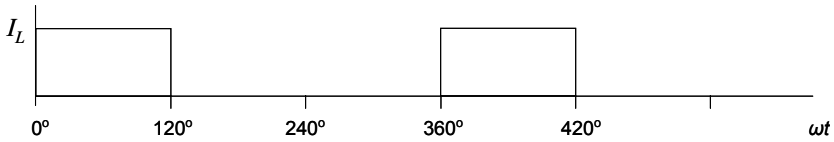
Q .2: The current in phase A of a three-phase half-wave diode rectifier supplied from a three-phase wye-connected source is given below. The rms value of current is:

a. $\frac{I_L}{3}$

b. $\frac{I_L}{2}$

c. $\frac{I_L}{\sqrt{3}}$

d. $\frac{I_L}{\sqrt{2}}$



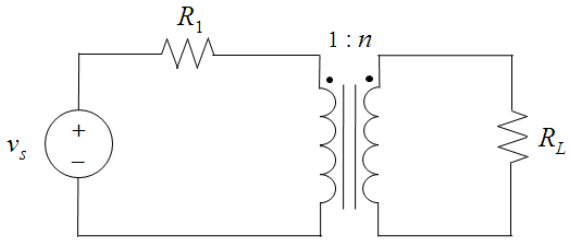
Q .3: In the circuit given below, $v_s = 18\sin \omega t$, $R_1 = 1\ \Omega$ and $R_L = 4\ \Omega$. The value of n for which the source delivers maximum power to load R_L is:

a. 1

b. 2

c. 3

d. 4



Q .4: Schokley diode is a:

a. Two-layer pn junction device.
b. Three-layer pin junction device.
c. Four-layer pnpn junction device.
d. None of the above.

Q .5: Consider Insulated Gate Bipolar Transistor (IGBT) and Bipolar Junction Transistor (BJT). Which of the following statement is correct:

a. Both IGBT and BJT are current-controlled devices
b. Both IGBT and BJT are voltage-controlled devices
c. IGBT is a current-controlled device and BJT is a voltage-controlled device
d. IGBT is a voltage-controlled device and BJT is a current-controlled device

Q .6: The MOSFET when used in a common-source amplifier operates in:

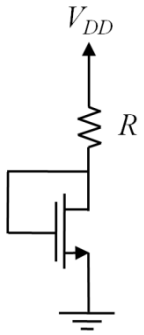
a. Saturation region only.
b. Triode region only.
c. Both saturation and triode regions.
d. Both cut-off and triode regions.

Q .7: An n-channel enhancement MOSFET with channel length L = 1 µm, channel width W = 8 µm and threshold voltage Vt = 0.8 V operates in the saturation region. The process transconductance parameter is 200 µA/V2. The gate-to-source voltage for a drain current of 100 µA is:

a. 1.15 V.
b. 1.25 V.
c. 1.35 V.
d. 1.45 V.

Q .8: The MOSFET in the circuit given below has channel length L = 0.8 µm, channel width W = 8 µm and threshold voltage Vt = 1 V. The process transconductance parameter is 100 µA/V2 and supply voltage VDD is 5 V. The voltage drop across resistor R for a drain current of 100 µA is:

a. 2.41 V.
b. 2.00 V.
c. 3.55 V.
d. 4.00 V.



Q .9: The input and output impedances of a voltage follower based on an ideal operational amplifier are:

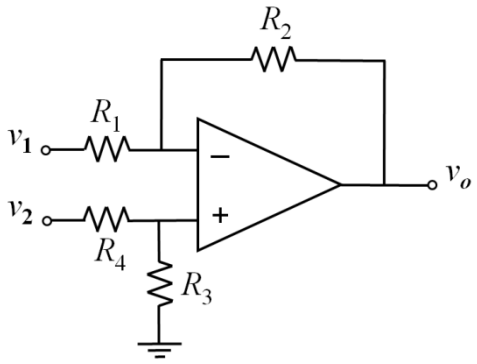
a. infinite and zero, respectively.

b. zero and Infinite, respectively.

c. both infinite.

d. both zero.

Q .10: The circuit given below employs an ideal operation amplifier. The input voltages are $v_1 = v_2 = 3$ V, and resistor values are $R_1 = 50$ kΩ, $R_2 = 100$ kΩ, $R_3 = 20$ kΩ and $R_4 = 10$ kΩ. The output of the circuit is:



a. 0.0 V.

b. 1.5 V.

c. 3.0 V.

d. 6.0 V.

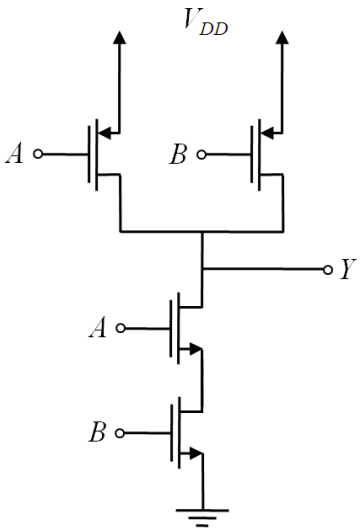
Q .11: The CMOS circuit shown in the following figure implements a:

a. Two-input OR gate.

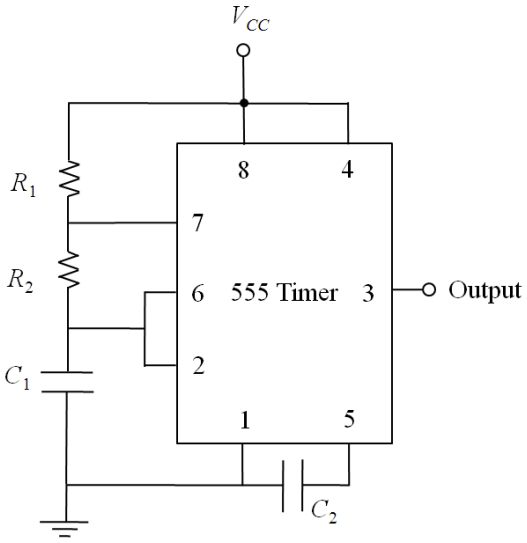
b. Two-input NOR gate.

c. Two-input AND gate.

d. Two-input NAND gate.



Q .12: Consider a stable multivibrator shown in the following figure. In this circuit, V_{CC} = 5 V, R_1 = 10 kΩ, R_2 = 5 kΩ, C_1 = 0.1 µF and C_2 = 0.01 µF. The frequency of the astable multivibrator is:



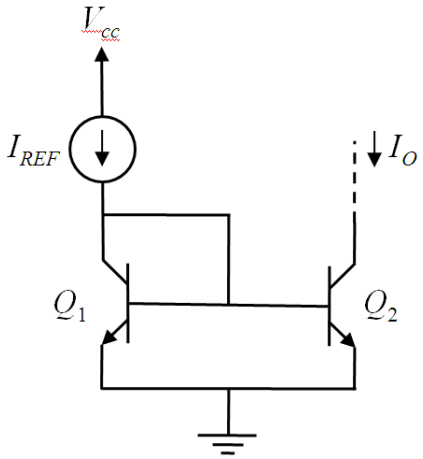
a. 576 Hz.

b. 720 Hz.

c. 5.76 kHz.

d. 7.2 kHz.

Q .13: The current mirror shown in the following figure uses identical transistors Q_1 and Q_2 each of which has β = 100. For this circuit:



a. IO = 0.10 IREF.

b. IO = 0.98 IREF.

c. IO = IREF.

d. IO = 100 IREF.

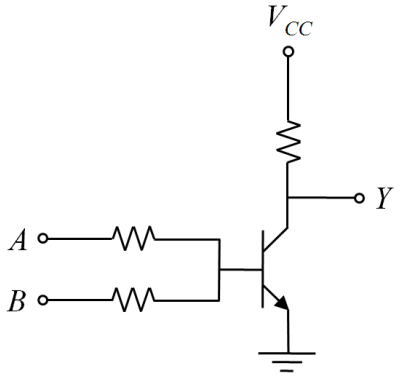
Q .14: The circuit given in the following figure is:

a. OR gate.

b. AND gate.

c. NOR gate.

d. NAND gate.



Q .15: Photodiode is a:

a. Semiconductor pn junction diode and operates in reverse-bias region.

b. Semiconductor pn junction diode and operates in forward-bias region.

c. Metal to semiconductor junction diode and operates in reverse bias region.

d. Metal to semiconductor junction diode and operates in forward bias region.

Q .16: Consider the optical outputs of Light Emitting Diode (LED) and laser diode. Which of the following statements is correct?

a. Optical outputs of both LED and laser diode are coherent.

b. Optical outputs of both LED and laser diode are incoherent.

c. Optical output of LED is incoherent and that of laser diode is coherent.

d. Optical output of LED is coherent and that of laser diode is incoherent.

Q .17: In a four-level optically-pumped laser,

a. The energy of pumping transition is greater than the energy of laser transition and the wavelength of pumping light is longer than the wavelength of laser light.

b. The energy of pumping transition is greater than the energy of laser transition and the wavelength of pumping light is shorter than the wavelength of laser light.

c. The energy of pumping transition is less than the energy of laser transition and the wavelength of pumping light is shorter than the wavelength of laser light.

d. The energy of pumping transition is less than the energy of laser transition and the wavelength of pumping light is longer than the wavelength of laser light.

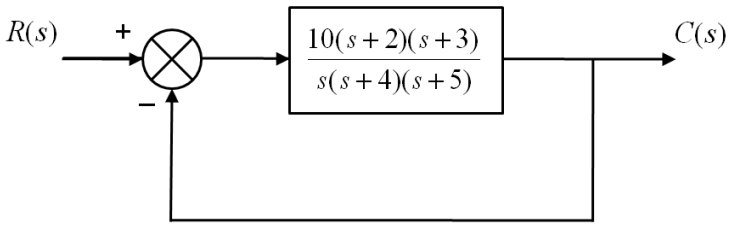
Q .18: Consider the system shown in the figure given below. The steady-state error of the system to unit step input is:

a. 0.

b. 3.

c. ∞.

d. None of the above.



Q .19: A system is described by the following differential equation:

$$\frac{d^3c(t)}{dt^3} + 5\frac{d^2c(t)}{dt^2} + 7\frac{dc(t)}{dt} + 9c(t) = 5r(t)$$

where $c(t)$ and $r(t)$ represent the output and input, respectively.

The system matrix in the state-space representation of the system is of order:

a. 3 x 1

b. 3 x 2

c. 3 x 3

d. 3 x 4

Q .20: A digital system is characterized by the following difference equation:

$$y(k+2) + 1.2y(k+1) + 0.35y(k) = u(k+2) + 0.5u(k+1)$$

The poles of the system are:

a. –0.5 and –0.7

b. –1 and –0.5

c. 0, –1 and –2

d. –1, –1.2 and –0.35