

COMPETITOR'S INSTRUCTION:-

**Attempt all questions: Where applicable circle the letter that indicates the correct answer.
Otherwise answer questions as instructed**

ANALOGUE FUNDAMENTALS

B1.1 The formula for electrical circuit resistance is:

- a) Voltage / Current.
- b) Current * Voltage.
- c) Voltage + Current.
- d) Current / Voltage.

(0.5)

B1.2 Electric current is the flow of which of the following?

- a) Neutrons
- b) Photons
- c) Electrons
- d) Quarks

(0.5)

B1.3 Which of the following is a unit of electrical current?

- a) Volt
- b) Amp
- c) Ohm
- d) Coulomb

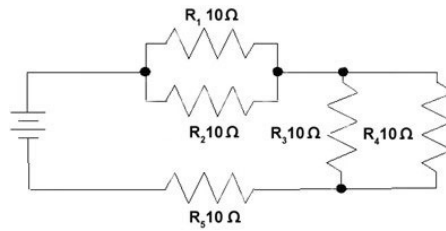
(0.5)

B1.4 In a DC circuit with a constant voltage, if the circuit resistance increases the circuit current will:

- a) decrease.
- b) stop.
- c) increase.
- d) remain constant.

(0.5)

B1.5 Calculate the total circuit current with a supply voltage of 3 volts.



Calculations:

(0.5)

B1.6 A Zener has the following markings BZY88C5V1:

What is the value of the Zener voltage?

(0.5)

B1.7 Express 1/50, as a decimal number.

- a) 2.00
- b) 0.02
- c) 0.20
- d) 0.50

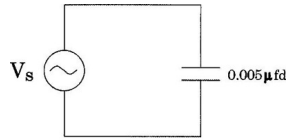
(0.5)

B1.8 A step-down transformer decrease the output:

- a) voltage.
- b) current.
- c) power.
- d) frequency.

(0.5)

B1.9 If the frequency of the source (V_s) is 1 kHz, what is the value of the capacitive reactance (X_c) of the circuit if the capacitor value is changed to $0.1 \mu\text{F}$?



$$X_c = \frac{1}{2\pi fC}$$

$$X_c = 31.83\text{K}\Omega$$

$$\text{When } C = 0.005 \mu\text{fd}$$

(0.5)

Calculation:

B1.10 Calculate the peak-to-peak voltage of a $20.0 \text{ V}_{\text{RMS}}$ sine wave?

(1.0)

Calculation:

B1.11 Which one of the following best describes a coaxial cable?

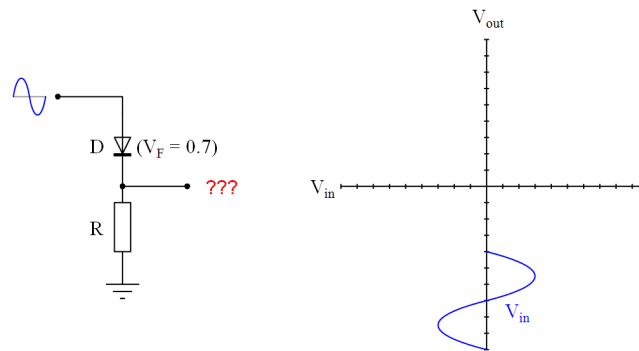
- a) It has twisted pairs of flexible PVC covered copper wires with a screened shield and a final covering of PVC insulation
- b) It has a centre copper conductor covered with thick insulation, then copper outer conductor (braided or solid) then outer covered in PVC insulation.
- c) It has multi cores and multi stranded copper wires covered in PVC insulated with an outer sheath of PVC insulation..
- d) It has two cores PVC insulated with solid copper wires and a outer covering of PVC insulation.

(0.5)

B1.12 The forward characteristic of a diode has a slope of approximately 50mA/V at a desired point. The approximate incremental resistance of the diode is

- a) 50Ω b) 35Ω c) 20Ω d) 10Ω (1.0)

B1.13 Sketch the transfer characteristic for a realistic diode (silicon, with 0.7 volts forward drop), and use this characteristic to plot the half-wave rectified output waveform given a sinusoidal input:



Answer:

(1.0)

B1.14 MOSFET can be used as a:

- (a) current controlled capacitor
(b) voltage controlled capacitor
(c) current controlled inductor
(d) voltage controlled inductors

(1.0)

B1.15 Thermal runaway is not possible in FET because as the temperature of FET increases:

- (a) the mobility decreases
- (b) the transconductance increases
- (c) the drain current increases
- (d) none of the above

(1.0)

B1.16 A source follower using an FET usually has a voltage gain which is:

- (a) greater than +100
- (b) slightly less than unity but positive
- (c) exactly unity but negative
- (d) about -10

(1.0)

B1.17 A change in the value of the emitter resistance R_e in a differential amplifier:

- (a) affects the difference mode gain A_d
- (b) affects the common mode gain A_c
- (c) affects both A_d and A_c
- (d) does not affect either A_d and A_c

(1.0)

B1.18 Negative feedback in an amplifier:

- a) Reduces gain
- b) Increase frequency & phase distortion
- c) Reduces bandwidth
- d) Increases noise

(1.0)

B1.19 What is the approximate input impedance of the OPAMP circuit which has $R_i=10k$, $R_f=100k$, & $R_L=10k$:

- (a) ∞
- (b) 120k
- (c) 110k
- (d) 10k

(1.0)

B1.20 The differential amplifier i/p stage of an OP-AMP is done to provide a very high:

- (a) CMRR
- (b) bandwidth
- (c) slew rate
- (d) open-loop gain

(1.0)

B1.21 Three identical amplifiers each one having a voltage gain of 50, an input resistance of $1\text{K}\Omega$ & an output resistance of 250 ohms, are cascaded. The open circuit voltage gain of the combined amplifier is

- a) 49dB
- b) 51dB
- c) 98dB

(1.0)

Digital Fundamentals

B1.22 The NAND gate output will be low if the two inputs are:

- (A) 00
- (B) 01
- (C) 10
- (D) 11

(1.0)

B1.23 What is the binary equivalent of the decimal number 368:

- (A) 101110000
- (B) 110110000
- (C) 111010000
- (D) 111100000

(1.0)

B1.24 The decimal equivalent of hex number 1A53 is:

- (A) 6793
- (B) 6739
- (C) 6973
- (D) 6379

(1.0)

B1.25 Show the simplification of the Boolean expression $(ABC) + (ABC)$:

- (A) 0
- (B) 1
- (C) A
- (D) BC

Expression solution:

(2.0)

B1.26 Show the 2's complement of the number 1101101:

Solution:

(2.0)

B1.27 Which one of the following memory is a volatile memory:

- (A) ROM
- (B) RAM
- (C) PROM
- (D) EEPROM

(1)

B1.28 The logic circuit shown in the given fig.2 can be minimised to :

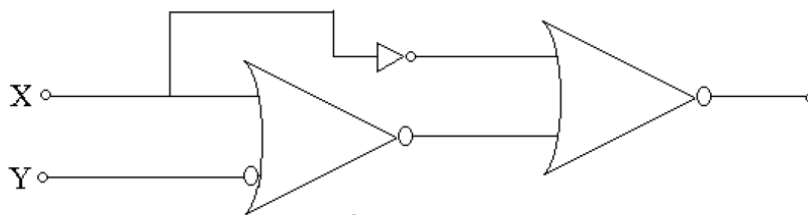
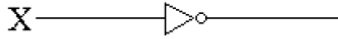
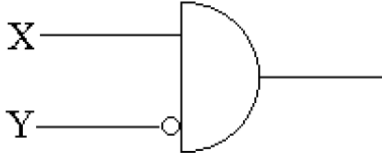
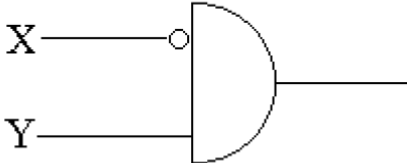
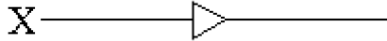


Fig.2

- | | | | |
|-----|---|-----|--|
| (A) |  | (B) |  |
| (C) |  | (D) |  |

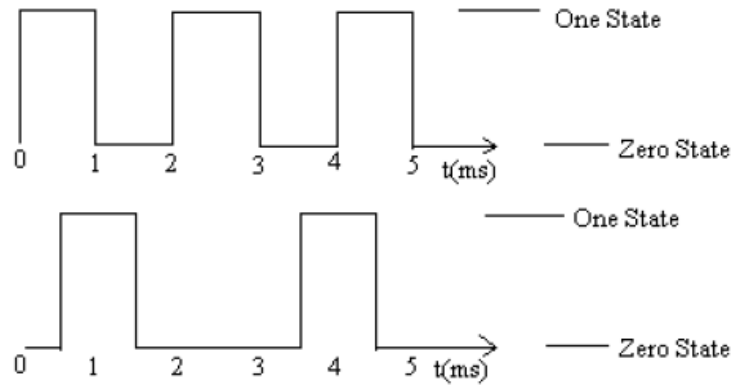
Show solution :

(2.0)

B1.29 The voltage waveforms shown below are applied at the inputs of 2-input:

- i) AND and
- ii) OR gates.

Sketch the output waveforms from each gate.



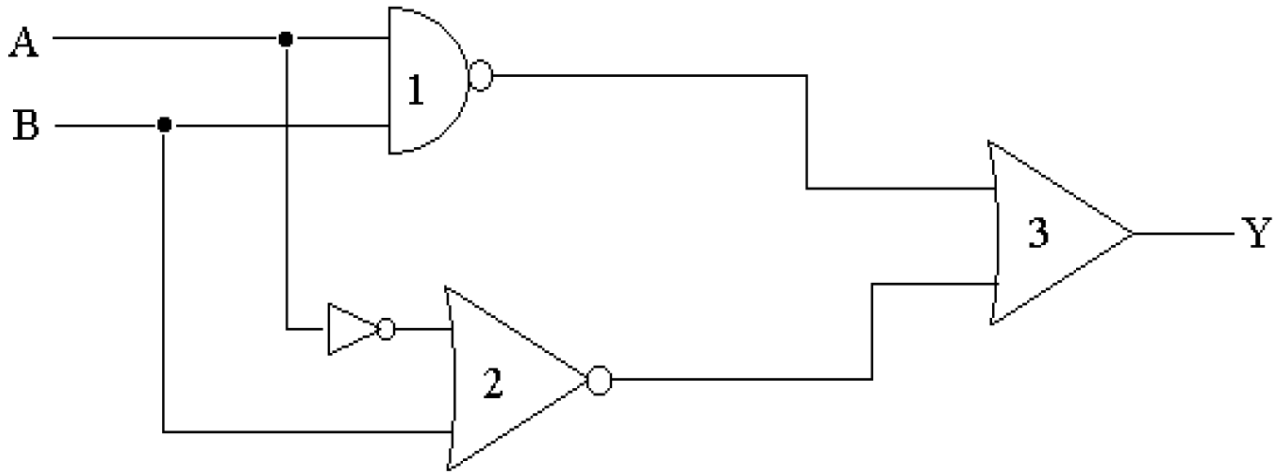
Sketch solution:

i)

ii)

(2.0)

B1.30 Find the Boolean expression for logic circuit shown below and reduce it using Boolean algebra



Solution:

(2.0)