University of Colombo, Sri Lanka

University of Colombo School of Computing

BACHELOR OF SCIENCE IN COMPUTER SCIENCE

Second Year Examination - Semester II - UCSC AY19 [held in March-May 2023]

SCS2213 – Electronics and Physical Computing

(Two (2) Hours)

Answer ALL questions

Number of Pages = 19   Number of Questions = 60 MCQs

To be completed by the candidate

Index Number: ☐☐☐☐☐☐☐☐

Important Instructions to candidates:

I. Note that questions appear on both sides of the paper. If a page or a part of this question paper is not printed, please inform the supervisor immediately.

II. This paper consists of **60 Multiple-Choice Questions (MCQs)** in **19 pages** (including the Cover Page). Each question carries equal marks.

III. The MCQs in this paper are organized into **two sections** (section 1 and 2) with separate instructions at the beginning of the section. Therefore, please read those instructions before answering the questions.

IV. Answer ALL questions and submit your answers in the **MCQ Answer Sheet** provided. Please read the instructions given in the back side of the MCQ answer sheet as well.

V. Calculators and any electronic device capable of storing and retrieving text including electronic dictionaries, smart watches and mobile phones are **not allowed**.

EPC – 2022

Note: Each question in this section (questions 1-35) can have only one correct (or best) answer. If you select more than one option for a question, you will lose all the marks for that question. The resistor color code values are given in the last page.

1. Which of the following options states the correct order of circuit symbols shown in the picture from left to right?
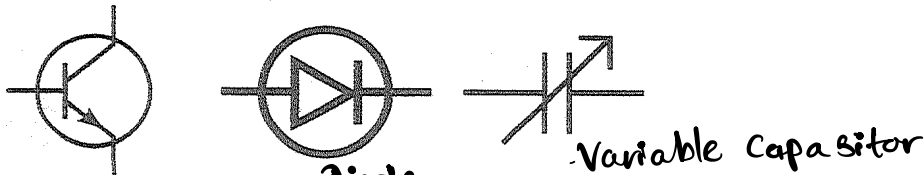
(handwritten annotations:) NPN transistor   Diode   Variable Capasitor
if there are out going arrows → LED

A) NPN Transistor, LED, Variable Resistor
B) PNP Transistor, Power Diode, Variable Capacitor
C) NPN Transistor, Power Diode, Variable Resistor
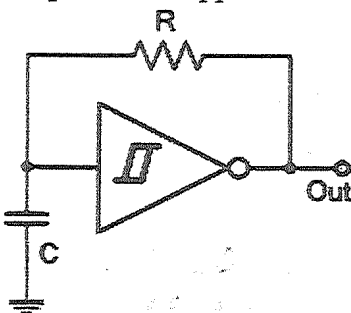D) PNP Transistor, LED, Variable Capacitor
E) None of the above ✓

2. What is the resistance of a resistor if its color band contains Red, Green, Orange, and Gold colors in the sequence?

A) 15 kΩ
B) 251 Ω
C) 25 kΩ ✓
D) 2.5 kΩ
E) None of the above

(handwritten:) $25 \times 10^3 \pm 5\%$

$25\,k\Omega$

3. Which of the following options sufficiently represents the output of the given circuit when the power is supplied?

(handwritten:) explanation

Schmitt Trigger Oscillator

The circuit shown below is a Schmitt trigger RC oscillator using a digital Schmitt trigger inverter gate. The digital Schmitt trigger gate has a built-in hysteresis (0.8V) and the threshold voltages are V_{T+} (1.6V) and V_{T-} (0.8V). R1 connects the circuit in a positive feedback loop necessary for oscillation.

1. When the Vc is less than V_{T-}, Vo goes high (3.4V) and starts charging the capacitor C1 through R1.
2. When Vc crosses the threshold voltage V_{T+}, Vo goes low (0.2V) and discharging of C1 through R1 begins.
3. When Vc crosses the threshold voltage V_{T-}, step 1 is repeated. Thus the oscillating output is created.

Voltages are the typical values given by the 74LS14 specification.
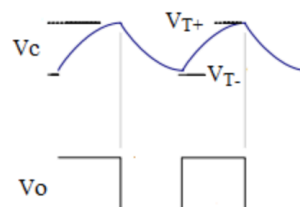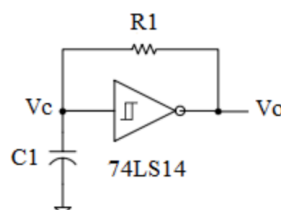
A) Logic 1 ✗
B) Logic 0 ✗
C) Square wave signal ✓
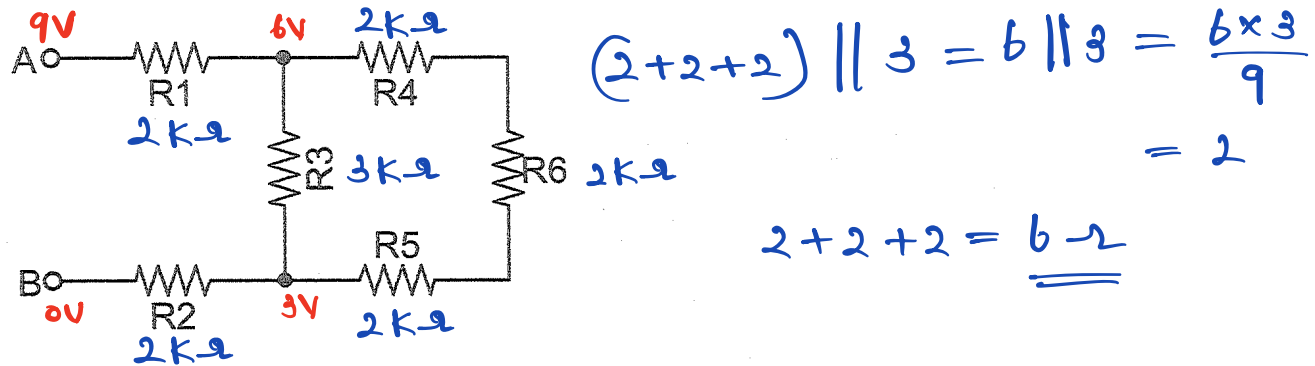D) Sawtooth signal ✗
E) None of the above ✗

4. What is the resistance of a resistor if its color band contains Red, Black, Yellow, and Gold, in the sequence?

A) 20.4 Ω
B) 210 kΩ
C) 200 kΩ
D) 2 MΩ
E) None of the above

$20 \times 10^4 \pm 5\%$

$200\ k\Omega$

Consider the following circuit diagram to answer the questions 5-7.

$(2+2+2)\ ||\ 3 = 6\ ||\ 3 = \dfrac{6 \times 3}{9}$

$= 2$

$2+2+2 = 6\ \Omega$

Assume that R3 is 3kΩ and all the other resistors in the circuit are 2 kΩ.

5. What is the equivalent resistor value between A and B in the above circuit?

A) 4.5 kΩ
B) 7 kΩ
C) 10 kΩ
D) 13 kΩ
E) None of the above

6. How much current flows through the resistor R1 if a 9V battery is connected between A and B in the above circuit?

A) 40.5 mA
B) 2 A
C) 2 mA
D) 1 A
E) None of the above

$V = IR$

$I = \dfrac{9}{6} = 1.5\ mA$

7. What is the voltage across R3 if a 9V battery is connected between A and B in the above circuit?

A) 1V
B) 2V
C) 3V
D) 4V
E) None of the above

$\dfrac{9V}{(2+2+2)} \times 2 = 3V$

8. What are the first three color bands of a 2.2 MΩ resistor?

A) Red, Red, and Green
B) Red, Red, and Yellow
C) Red, Red, and Gold
D) Red, Black, and Yellow
E) None of the above

2.2×10^6

22×10^5

9. What current limiting resistor value (R) is required to power up three LEDs in series as in the following diagram when the supply voltage is 12V? Assume that the recommended forward voltage and current for each LED is 3V and 30mA, respectively.
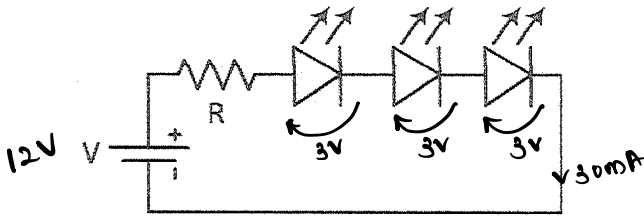
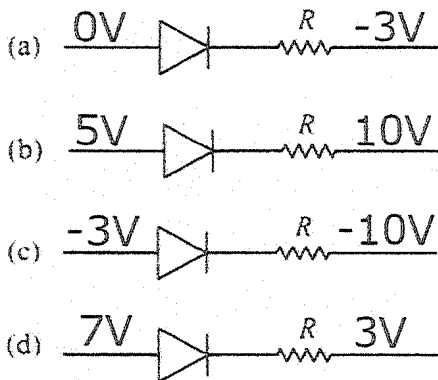ohm's law for R;

$$\Delta V = IR$$

$$12 - (3 \times 3) = 30 \times R$$

$$R = \frac{3}{30} = 0.1 \text{ K} \Omega$$

$$= 100 \Omega$$

A) 100 Ω
B) 33.3 Ω
C) 300 Ω
D) 0.1 Ω
E) None of the above

10. Which option is **TRUE** about the following diodes?

A) Diodes in (a) and (c) are reverse biased while diodes in (b) and (d) are forward biased
B) All the diodes are forward biased
C) Diode in (b) is reverse biased while other diodes are forward biased
D) Only the diode in (d) is forward biased while other diodes are reverse biased
E) None of the above

Consider the following electronic component to answer the questions 11-12.

(handwritten) Ceramic — non polarized

11. What is the component shown in the picture?

A) Polyester capacitor
B) Electrolytic capacitor
C) Mylar capacitor
D) Ceramic capacitor ✓
E) None of the above

12. What is the capacitance value of the above component?

A) 222 μF
B) 2200 μF
C) 0.22 μF
D) 0.0022 μF ✓
E) None of the above

(handwritten)
22②2 → no. of zeros
↳ first two digits of the capacitance
2200 pico farads = 2.2 nf = 0.0022 μF
↳ $\times 10^{-12}$ ↓
                        10^{-9}

13. What is the logically equivalent gate represented by the following logic diagram?

(handwritten next to diagram)
0
1
1
0
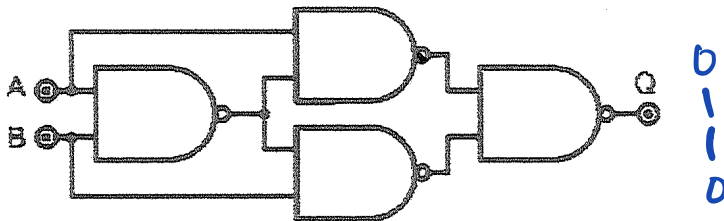
A) AND Gate
B) NOR Gate
C) XOR Gate ✓
D) XNOR Gate
E) None of the above

(handwritten)
method 01

A	B	Z
0	0	0
0	1	1
1	0	1
1	1	0

NAND

0	0	— 1
0	1	— 1
1	0	— 1
1	1	— 0

Alt method

$$= \overline{\left\{ \overline{\left[\overline{(\overline{A \cdot B})} \cdot A \right] \cdot \left[\overline{(\overline{A \cdot B})} \cdot B \right]} \right\}}$$

$$= \left[\overline{\overline{\overline{(\overline{A \cdot B})} \cdot A}} \right] + \left[\overline{\overline{\overline{(\overline{A \cdot B})} \cdot B}} \right]$$

$$= \left[\overline{(\overline{A \cdot B})} \cdot A \right] + \left[(\overline{A \cdot B}) \cdot B \right]$$

$$= \left[(\overline{A \cdot B}) + \overline{A} \right] + \left[(\overline{A \cdot B}) + \overline{B} \right]$$

$$= \overline{A} + \overline{B} + \overline{A} + \overline{A} + \overline{B} + \overline{B}$$
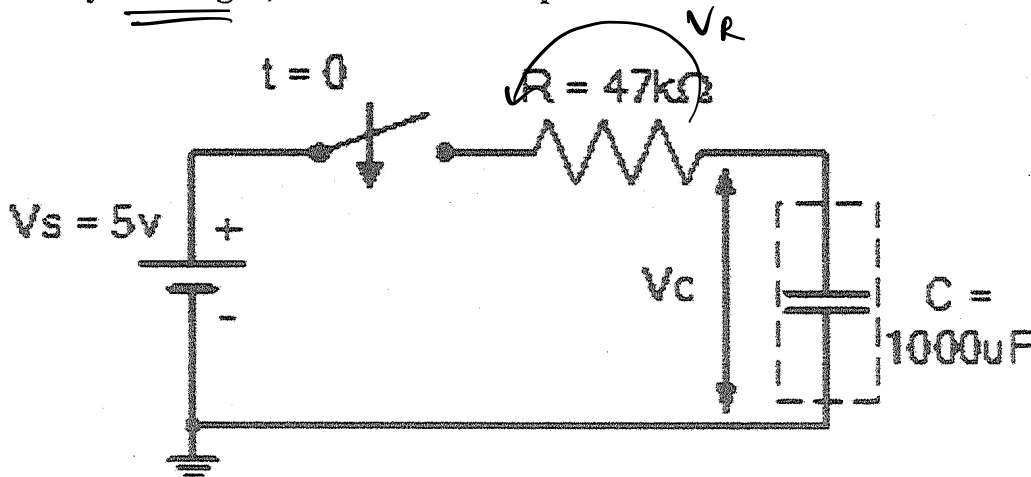
$$= \overline{A} + \overline{B}$$

$$= \overline{A \cdot B}$$

A	B	AB	$\overline{AB}$	
0	0	0	1	
0	1	0	1	$\overline{AND} \Rightarrow NAND$
1	0	0	1	
1	1	1	0	

Consider the following RC circuit to answer the questions 14-15. At time t=0, the capacitor is fully discharged, and the switch is open.

14. What is the time constant of the above RC circuit?

A) 21.3 seconds
B) 47 seconds
C) 60 seconds
D) 235 seconds
E) None of the above

$$\tau = RC$$
$$47 \times 10^3 \times 10^3 \times 10^{-6} = 47\,s$$

15. What will be the voltage across the resistor (R) after one time constant from the switch is closed?

A) 0.63 V
B) 1.85 V
C) 3.15 V
D) 5 V
E) None of the above

$$V_R = V_S - V_C\,(t = 47s)$$

$$5 - \left(5 \times \frac{63.2}{100}\right) = 1.84 \simeq 1.85$$

16. Which of the following is NOT a way of specifying the function of a sequential logic circuit?

A) Truth table
B) Boolean expression
C) Logic diagram
D) Timing diagram
E) None of the above

17. Which digital component is represented by the following truth table? Please note that A and B are the inputs and Q0 to Q3 are the outputs of the component.

A	B	Q_0	Q_1	Q_2	Q_3
0	0	1	0	0	0
0	1	0	1	0	0
1	0	0	0	1	0
1	1	0	0	0	1

A) A 2-to-4 binary encoder
B) A 2-to-4 binary decoder
C) A 4-to-2 multiplexer
D) A 2-to-4 multiplexer
E) None of the above

Consider the following BCD-to-Decimal digital IC to answer the questions 18-20.
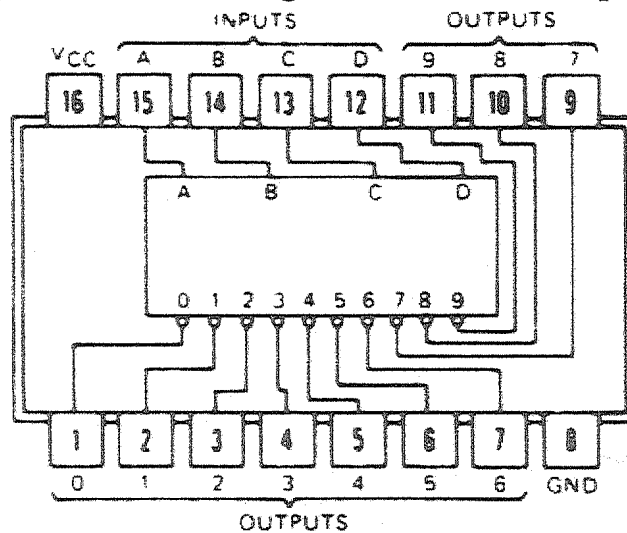
Note: pin 15 (A) and pin 1 (0) are the LSBs of the input and output ports.

18. What is the correct name of the above IC?

A) 4-to-10 Line BCD-to-Decimal Decoder
B) 4-to-16 Line BCD-to-Decimal Decoder
C) 4-to-10 Line BCD-to-Decimal Encoder
D) 10-to-4 Line BCD-to-Decimal Encoder
E) None of the above

19. What should be the input to ABCD of the above IC to obtain the decimal number 7 as the output?

A) 1000
B) 1110
C) 0001
D) 0111
E) None of the above

20. What will be the output pattern if ABCD=1010 in the above IC?

A) 0000010000
B) 1111111111
C) 0000000000
D) 1111101111
E) None of the above

21. What current limiting resistor value is required to power up three LEDs in parallel as in the following diagram when the supply voltage is 12V? Assume that the recommended forward voltage and current for each LED is 3V and 30mA, respectively.
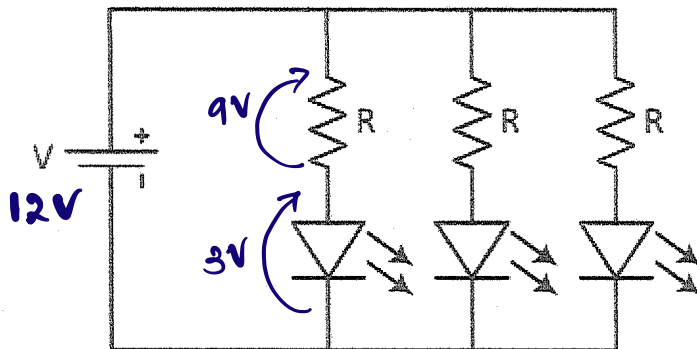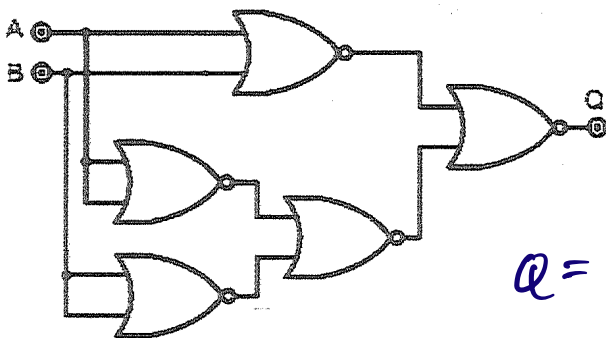

$$\frac{R}{\Delta V = \mathcal{I} R}$$

$$R = \frac{9}{30} = 0.3 k\Omega$$

$$= 300 \Omega$$

A) 100 Ω
B) 300 Ω
C) 33.3 Ω
D) 0.1 Ω
E) None of the above

22. What is the resulting gate represented by the following logic diagram?

$$Q = \left[\overline{\overline{(A+A)} + \overline{(B+B)} + \overline{(A+B)}} \right]$$

$$= \left[\overline{(A+A)} + \overline{(B+B)} \right] \cdot (A+B)$$

$$= \left[(\bar{A} \cdot \bar{A}) + (\bar{B} \cdot \bar{B}) \right] \cdot (A+B)$$

$$= (\bar{A}\bar{A} + \bar{B}\bar{B}) \cdot (A+B)$$

$$= \bar{A}\bar{A}A + \bar{A}\bar{A}B + \bar{B}\bar{B}A + \bar{B}\bar{B}B$$

$$= \bar{A}\bar{A}B + \bar{B}\bar{B}A$$

A) XOR Gate
B) NAND Gate
C) XNOR Gate
D) AND Gate
E) None of the above

23. What are the first three color bands of a 0.2 Ω resistor?

A) Red, Black, Black
B) Silver, Black, Red
C) Silver, Red, Black
D) Red, Black, and Gold
E) None of the above ✓

A	B	$\bar{A}$	$\bar{B}$	$\bar{A}\bar{A}B$	$\bar{\bar{B}}\bar{B}A$	$\bar{A}\bar{A}B + \bar{\bar{B}}\bar{B}A$
0	0	1	1	0	0	0
0	1	1	0	1	0	1
1	0	0	1	0	1	1
1	1	0	0	0	0	0

24. What is the voltage at the collector (C) relative to the ground in the following circuit? Assume that $V_{BE} = 0$.

$+V_{CC} = 20$ V

$R_C = 1$ kΩ

$R_1 \gtrless 10$ kΩ

10V

$R_2 \gtrless 10$ kΩ

$R_E = 5$ kΩ
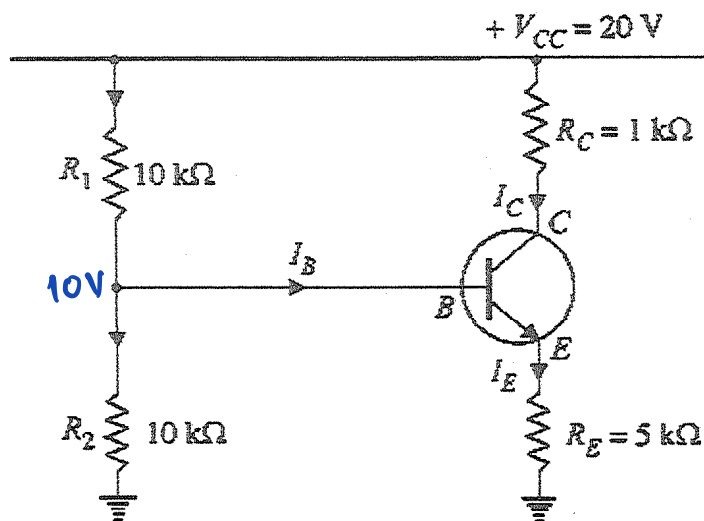
$V_{BE} = 0 < 0.7$V
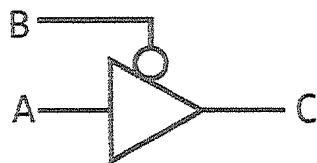cut off
$I_B = I_C = 0$
$V_{CE} = V_{CC} = 20$V

A) 2 V
B) 8 V
C) 10 V
D) 18 V
E) None of the above ✓

25. What is the digital component represented by the following symbol?

A) Active-high Tri-state Buffer
B) Active-high inverting tri-state buffer
C) Active-low Tri-state Buffer
D) Active-low Inverting Tri-state Buffer
E) None of the above

Consider the following diagram of a multimeter to answer the questions 26-28.
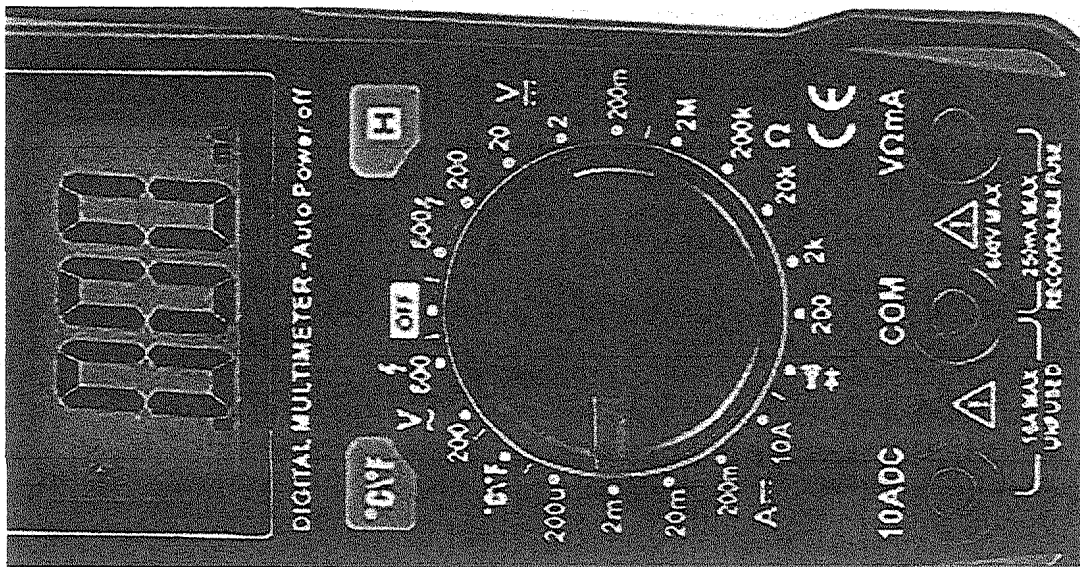
26. What the multimeter is set to measure?

A) Voltage
B) Current
C) Continuity
D) Resistance
E) None of the above

27. What is the maximum current that can be measured using the above multimeter?

A) 200 mA
B) 20 A
C) 10 A
D) 0.001 A
E) None of the above

28. Which of the following set of steps is required to measure current up to 300mA?

A) Connect the black probe to COM and red probe to VΩmA, turn the probe to 10A
B) Connect the black probe to COM and red probe to 10A, turn the probe to 10A
C) Connect the black probe to COM and red probe to VΩmA, turn the probe to 100V
D) Connect the black probe to COM and red probe to 10A, turn the probe to 200m
E) None of the above

29. Which of the following statement is correct about the following breadboard circuit?
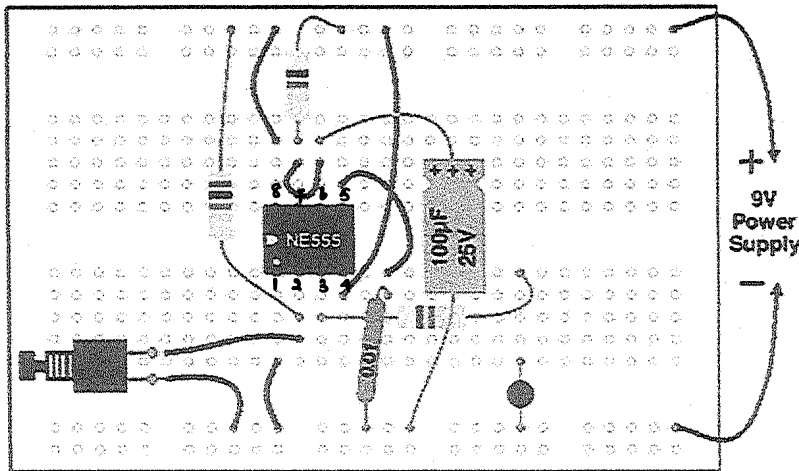
A) Pin 1 of the IC is connected to Vcc
B) Pin 6 of the IC is connected to Vcc through a resistor
C) Pin 4 of the IC is connected to GND
D) Pin 2 and 3 of the IC are connected to each other
E) None of the above
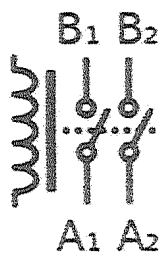

30. What is the peak voltage of 220 VAC in the national power supply grid?

A) 110 V
B) 220 V
C) 310 V
D) 440 V
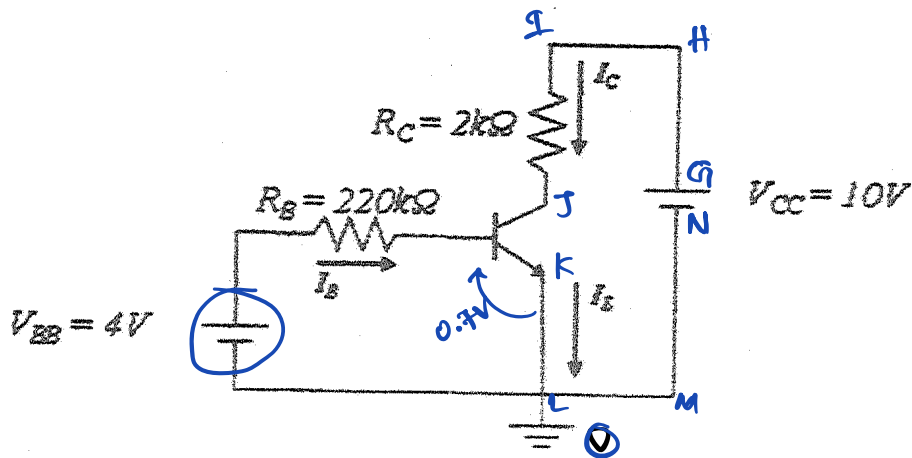E) None of the above

$$V_{rms} = \frac{V_o}{\sqrt{2}}$$

$$V_o = 220 \times \sqrt{2} = 310V$$

31. What is the electronic component represented by the following symbol?

A) A DPDT relay
B) A DPST relay
C) A step-up transformer
D) A DPDT switch
E) None of the above

Consider the following circuit diagram to answer the questions 32-34.

Note: $\beta = 300$ and $V_{BE} = 0.7V$

32. What is the base current (I_B) in the above circuit?

A) 5 mA
B) 15 mA
C) 18 mA
D) 15 µA
E) None of the above

$$I_B = \frac{4 - 0.7}{220} = 0.015mA = 15\mu A$$

33. What is the collector current (I_C) in the above circuit?

A) 5 mA
B) 4.65 mA
C) 4.5 mA
D) 1.5 mA
E) None of the above

$$\beta = \frac{I_c}{I_B}$$

$$I_c = 300 \times 15\mu A = 4500 \mu A = 4.5\, mA$$

34. What is the voltage between the C and E of the transistor (V_{CE}) in the above circuit?

A) 0.3 V
B) 1 V
C) 4.5 V
D) 9 V
E) None of the above

$$KVL (GHIJKLMN)$$
$$10 - 4.5 \times 2 - V_{CE} = 0$$
$$V_{CE} = 1V$$

35. Which of the following option contains only the sequential logic circuits?

A) Shift-register, J-K flip-flop, adder
B) Comparator, decoder, counter
C) Counter, S-R flip-flop, shift-register
D) Multiplexer, encoder, adder
E) None of the above

Section 2 – Physical Computing

Note: Each question in this section (questions 36-60) can have **multiple answers**; however, there will be a **deduction of marks for each wrong answer**. The minimum mark for a question is zero.

36. What is/are the application(s) of an ATMega328P microcontroller?

A) Analog signal acquisition
B) Computationally demanding image processing application
C) Analog signal processing
D) Multi-core computation
E) Embedded devices

37. What is/are **TRUE** regarding an ATMega328p microcontroller?

A) Processing power is higher than a modern microprocessor
B) Power consumption is higher than a modern microprocessor
C) Need external peripherals with I/O pins
D) Memory is limited
E) More expensive than a modern microprocessor

38. Which of the following is/are **NOT** a component of an ATMega328p microcontroller?

A) Crystal oscillator
B) I/O ports
C) General-purpose register arrays
D) ROM
E) Interrupt control units

39. Which of the following is/are **TRUE** regarding Arduino's "pinMode()" function?

A) The function accepts only one argument
B) It is used to set a pin to either Digital or Analog
C) The function accepts only two arguments
D) pinMode function should be used only for Analog pins
E) pinMode function should be used for Digital pins

40. Which of the following is/are **TRUE** regarding Arduino's "digitalRead()" function?

A) The function sends a voltage level to a Digital pin
B) The function sends a voltage level to an Analog pin
C) The function accepts only one argument
D) The function uses Analog to Digital Converters (ADC)
E) The function sends a Pulse Width Modulation (PWM) voltage signal to a digital pin

41. Which of the following is/are **TRUE** regarding Arduino's "digitalWrite()" function?

A) The function sends a voltage level to a Digital pin
B) The function sends a voltage level to an Analog pin
C) The function accepts only one argument
D) The function uses Analog to Digital Converters (ADC)
E) The function sends a Pulse Width Modulation (PWM) voltage signal to a digital pin

42. Which of the following is/are **TRUE** regarding Arduino's "analogRead()" function?

A) The function reads a voltage level from a Digital pin
B) The function sends a voltage level to an Analog pin
C) The function accepts only one argument
D) The function uses Analog to Digital Converters (ADC)
E) The function sends a Pulse Width Modulation (PWM) voltage signal to a digital pin

43. Which of the following is/are **TRUE** regarding Arduino's "analogWrite()" function?

A) The function reads a voltage level from a Digital pin
B) The function sends a voltage level to an Analog pin
C) The function accepts only one argument
D) The function uses Analog to Digital Converters (ADC)
E) The function sends a Pulse Width Modulation (PWM) voltage signal to a digital pin

44. Which of the following is/are **TRUE** regarding the Analog Digital Conversion (ADC)?

A) Analog signal is converted to a Digital signal by ADC
B) Digital signal is converted to an Analog signal by ADC
C) If the Analog to Digital Converter is 10-bit, 0V map with 0 state and 5V map with 1023 state
D) If the Analog to Digital Converter is 8-bit, 0V map with 0 state and 5V map with 255 state
E) If the Analog to Digital Converter is 10-bit, 0V map with 0 state and 5V map with 255 state

45. Which of the following is/are **TRUE** regarding the Pulse Width Modulation (PWM) in an
    Arduino board?

A) It is implemented for any Digital pin
B) It is implemented for specific Analog pins only
C) Six PWM pins can be found in the Arduino UNO board
D) Digital signal is converted to an Analog signal by the PWM
E) If the modulation is 8-bit, 0V maps with 0 and 5V maps with 1023

46. Which of the following is/are **TRUE** regarding External Interrupts in Arduino?

A) attachInterrupt() function is used to set up an external interrupt
B) detachInterrupt() function is used to remove an external interrupt
C) External interrupts can be set up for any Digital pin
D) External interrupts can be set up only for Analog pins
E) External interrupts can be enabled only for a defined time duration

47. Which of the following is/are **TRUE** regarding "attachInterrupt(intrpt, func, mode)" function in Arduino?

A) The "intrpt" argument of the function should be either -1 or 1
B) If the "intrpt" argument of the function is -1, it temporarily turns off the external interrupt
C) If the "intrpt" argument of the function is 1, it turns on the external interrupt
D) Setup an external interrupt inside the "func" function is legal in Arduino
E) The "mode" argument of the function can be LOW, RISING, FLOATING, CHANGE and HIGH

48. What is the actual data value of the following data transmission? (The Even parity mechanism is used in the data transmission.)
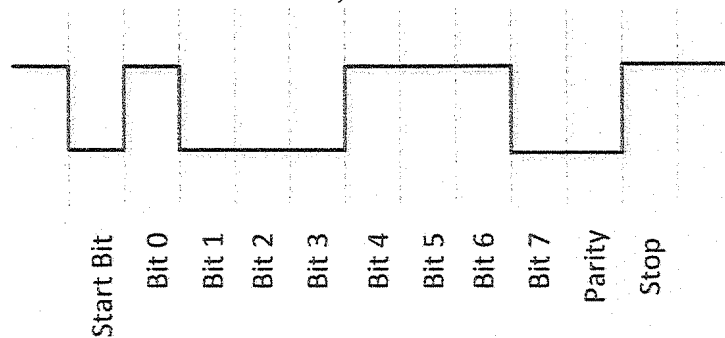
A) 10001110
B) 01110001
C) 011100011
D) 011100010
E) 01000111001

49. Which of the following is/are **TRUE** regarding UART communication?

A) Receiver's Rx pin connects to the transmitter's Tx pin
B) Transmitter's Rx pin connects to the receiver's Rx pin
C) UART is a half-duplex communication protocol
D) A common clock is shared with the receiver and the transmitter using Tx pins
E) A common shift register has been used for data-receiving and transmitting purposes

50. What is/are the actual data value(s) of the following synchronous data transmission?

Idle   **Idle or next byte**

Clock

0 1 2 3 4 5 6 7
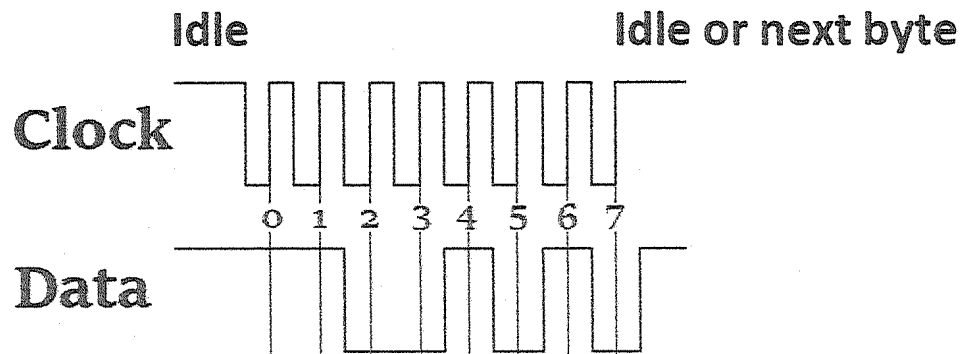
Data

A) 11001010
B) 01010011
C) 11100010
D) 11000010
E) 01010001

51. Which of the following is/are TRUE regarding the parity bits in UART communication?

A) The parity bit is 1; if it is even parity for the 11101100 data frame
B) The parity bit is 0; if it is odd parity for the 11101100 data frame
C) The parity bit is 1; if it is even parity for 00000100 data frame
D) The parity bit is set after the stop bit in UART communication
E) The receiver can recover a corrupted data frame using the parity bit data

52. Which of the following is/are TRUE regarding parallel communication?

A) Slower than serial communication
B) Cheaper than serial communication
C) Crosstalk is present
D) System upgradation is easier than serial communication
E) Can transmit data for a short distance

53. Which of the following is/are TRUE regarding synchronous communication?

A) Faster than asynchronous communication
B) Slower than asynchronous communication
C) Needs a common clock
D) Can transmit when ready
E) Uses in Serial data transmission

52)

A) Slower than serial communication - FALSE. Parallel communication is generally faster than serial communication because it transmits multiple bits simultaneously over multiple channels.

B) Cheaper than serial communication - FALSE. Parallel communication often requires more wires and hardware to transmit data in parallel, making it potentially more expensive than serial communication.

C) Crosstalk is present - TRUE. Crosstalk, which is interference caused by signals in nearby conductors, can occur in parallel communication due to the close proximity of multiple data lines.

D) System upgradation is easier than serial communication - FALSE. System upgradation in parallel communication can be more complex because it often involves upgrading multiple wires and components simultaneously, whereas in serial communication, upgrading typically involves fewer components.

E) Can transmit data for a short distance - FALSE. Both parallel and serial communication can transmit data over short or long distances depending on the design of the system and the transmission medium used. The distance capability is not inherently tied to whether communication is parallel or serial.

53)

A) Faster than asynchronous communication - TRUE. Synchronous communication is generally faster than asynchronous communication because it doesn't require start and stop bits and operates based on a shared clock signal.

B) Slower than asynchronous communication - FALSE. As mentioned above, synchronous communication is typically faster due to its continuous clocking mechanism.

C) Needs a common clock - TRUE. Synchronous communication requires a common clock signal shared between the transmitter and receiver to synchronize the data transmission.

D) Can transmit when ready - FALSE. In synchronous communication, data is transmitted based on the timing provided by the shared clock signal. It does not typically involve "transmit when ready" mechanisms commonly found in asynchronous communication.

E) Uses in Serial data transmission - TRUE. Synchronous communication can be used in both serial and parallel data transmission methods. However, it is commonly used in serial communication protocols where precise timing is essential.

54. Which of the following is/are **TRUE** regarding the I2C communication protocol?

~~A) I2C is a <u>full</u> duplex communication protocol~~ *half*
✓B) I2C consists of two bus lines
C) SCL bus line is responsible for generating clock pulses
D) SDA bus line is responsible for transmitting data parallelly across the devices
~~E) I2C is a <u>parallel</u> data transmission protocol~~ *serial*

55. Which of the following is/are **TRUE** regarding the SPI communication protocol?

A) SPI is a full duplex communication protocol
~~B) The data transmission occurs using <u>one</u> shared shift register~~ *2*
C) A virtual ring topology is created between the master and a slave
D) SPI is a serial data transmission protocol
~~E) SPI needs only <u>two</u> wires~~ *4*

56. Which of the following is/are **TRUE** regarding the signal propagation ranges?

~~A) Low error rate occurs in the "<u>Interference</u> Range."~~ *transmission*
~~B) Communication <u>is</u> possible in the "Detection Range."~~
C) Signal detection is possible in the "Detection Range."
D) Signal may not be detected in the "Interference Range."
~~E) Low error rate occurs in the "Connection Range."~~

57. Which of the following is/are **TRUE** regarding signal propagation modes?

A) Ground-wave propagation follows the contour of the earth
~~B) Satellite communication is an example of sky-wave propagation~~
C) Transmitting and receiving antennas must be within line of sight in Line-of-sight signal propagation
D) Signals are reflected from the Ionised layer in sky-wave signal propagation
~~E) High-bandwidth signals easily pass through buildings~~

Answer the questions 58-60 based on the following scenario.

Damith plans to create an Arduino-based humidity-temperature controller in his room to control an electric fan autonomously based on the room temperature. He uses the TMP36 sensor to read the room temperature.

58. What will be the receiving voltage of the analog pin, if the analog reading of the sensor is 100?

A) 1.95 V
B) 0.48 V
C) 3.33 V
D) 0.33 V
E) 1.21 V

$$\frac{5}{1024} \times 100 = 0.48\,V$$

59. What will be the correct room temperature, if the analog reading of the sensor is 204? Use the following equation to find the temperature in Celsius.

Temperature = (micro voltage level – 500)/10

A) 25.2 C
B) 10.5 C
C) 49.6 C
D) 30.2 C
E) 41.9 C

$$\left(\frac{5}{1024} \times 204\right) = 0.996\,V = 996\,mV$$

$$temp = (996 - 500)/10 = \frac{496}{10} = 49.6\,°C$$

60. Suppose *Damith* needs to increase the fan speed based on the room temperature; select the correct step(s) to design the circuit wiring.

A) Connect the electric fan one end to a ground pin of the Arduino board
B) Connect the electric fan one end to a ground pin and the other end to a digital pin of the Arduino board
C) Connect the electric fan one end to a ground pin and the other end to an analog pin of the Arduino board
D) Connect the electric fan one end to a ground pin and the other end to the 3.3V pin of the Arduino board
E) Connect the electric fan one end to a ground pin and the other end to the 5V pin of the Arduino board

****

Color	Digit	Multiplier	Tolerance (%)
Black	0	10^0 (1)	
Brown	1	10^1	1
Red	2	10^2	2
Orange	3	10^3	
Yellow	4	10^4	
Green	5	10^5	0.5
Blue	6	10^6	0.25
Violet	7	10^7	0.1
Grey	8	10^8	
White	9	10^9	
Gold		10^{-1}	5
Silver		10^{-2}	10
(none)			20