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B.Tech DEGREE EXAMINATION, DECEMBER 2023

Fifth, Sixth and Seventh Semester

18ECO108J - EMBEDDED SYSTEM DESIGN USING ARDUINO

(For the candidates admitted during the academic year 2020 - 2021 & 2021 - 2022)

Note:

i. **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.

ii. **Part - B** and **Part - C** should be answered in answer booklet.

Time: 3 Hours **Max. Marks: 100**

PART - A (20 × 1 = 20 Marks)

Answer **all** Questions

		Marks	BL	CO
1.	A program written with the IDE for Arduino is called _____. (A) IDE source (B) Sketch (C) Cryptography (D) Source code	1	1	1
2.	How many analog pins are used in Arduino UNO board? (A) 6 (B) 7 (C) 8 (D) 9	1	1	1
3.	The sign flag 's' in status register will set to one when ('N'--> negative flag, 'v'--> 2's complement overflow flag') (A) 'N' OR 'V' (B) 'N' AND 'V' (C) 'N' XOR 'V' (D) 'N' NOR 'V'	1	2	1
4.	Which area in Arduino IDE shows the notification of the process? (A) Menu bar (B) Edit bar (C) Button bar (D) Status bar	1	2	1
5.	j = 6 + k * 3; where k = 5 and the asterisk (*) is the multiplication operator. The correct answer for j is (A) 21 (B) 33 (C) 26 (D) 36	1	3	2
6.	A data item is declared if it _____ in the symbol table, but ___ an assigned *l value.* (A) does not exist, does not have (B) does not exist, has (C) exists, has (D) exists, does not have	1	2	2

7.	Consider the following code fragment:
	int c = 7;
	int k;
	k = ++c;
	What is the value of k?
	(A) 8 (B) 7
	(C) 6 (D) 9
		1	3	2

8. if (ptr1 < ptr2) { 1 2 2
...
}

if (ptr1 > 10) {
...
}

(A) Both are acceptable.
(B) First form is acceptable. The second form is unacceptable.
(C) Both are unacceptable.
(D) First form is unacceptable. The second form is acceptable.

9. This function sets the serial communications speed. 1 1 3
(A) Serial.begin(speed)
(B) Serial.read()
(C) Serial.write(val)
(D) Serial.printIn(val, format)

10. The _____ is used to measure the performance of the Analog communication systems. 1 3 3
(A) SNR (Signal to Noise ratio)
(B) Output power
(C) Output voltage
(D) Output current

11. The Arduino software treats ____ the PWM channels the ___, limiting them to ____ - bit resolution and hard wiring them to a relatively ____ frequency. 1 2 3
(A) Few of, in different way, eight, slow
(B) All, same, ten, slow
(C) All, same, eight, slow
(D) All, same, eight, fast

12. For Arduino Uno boards, dedicated pins for I^2C are____. Pin ___ is the SDA pin, and pin ___ is the SCL pin. 1 1 3
(A) A1 and A2; A1; A2
(B) A1 and A2; A2; A1
(C) A4 and A5; A4; A5
(D) A4 and A5; A5; A4

13. To read a signal on an external pin, we will need to write a ____ to the data direction bit ____. 1 2 4
(A) logic high, DDxn
(B) logic low, DDxn
(C) logic low, PORTxn
(D) logic high, PORTxn

14. In ADMUX register, if the bits REFS1-0 are ___ that yields internal 1.1 volt reference. 1 2 4
(A) 00
(B) 01
(C) 10
(D) 11

15. The ADPS2-0 are _____ bits in _____. 1 2 4
(A) Prescaler, ADCSRB
(B) Prescaler, ADCSRA
(C) Trigger Source, ADCSRA
(D) Trigger Source, ADCSRB

16. For CTC mode, the Waveform Generation Mode (WGM) bits are _____. 1 1 4
(A) 010
(B) 011
(C) 101
(D) 110

17. ZigBee is based on _____. 1 1 5
(A) IEEE 802.15.4
(B) IEEE 804.15.2
(C) IEEE 805.12.4
(D) IEIA 802.15.4

18. The IR signals are mainly used for transmitting commands over the _____ on _____ distances. 1 2 5
(A) air, short
(B) air, long
(C) cable, short
(D) cable, long

19. TMP35, TMP36, TMP37 devices are intended for single-supply operation from _____ to _____ maximum. 1 2 5

(A) 2.7 V, 5.5 V (B) 0 V, 5.5 V
(C) 0 V, 2.7 V (D) 2.0 V, 5.0 V

20. Match the following: 1 3 5

1. An RFID tag — a. that carries object identifying data
2. An RFID tag reader — b. that reads and writes tag data
3. A bag-end data base — c. that stores records associated with tag contents

(A) 1-b, 2-c, 3-a (B) 1-c, 2-a, 3-b
(C) 1-a, 2-b, 3-c (D) 1-a, 2-c, 3-b

PART - B (5 × 4 = 20 Marks) — Marks BL CO

Answer **any 5** Questions

21. List the power saving modes of ATmega328p. Explain them. 4 2 1

22. Define duty cycle. When the duty cycle of a pulse is 80% and the total time period is 250 microseconds. Calculate the ON time and OFF time. 4 3 1

23. What makes a Good function? 4 2 2

24. Explain the Right-Left Rule. 4 3 2

25. Draw an RS-232-to-TTL receiver circuit and explain. 4 4 3

26. With various options explain analogReference () function. 4 2 4

27. How PWM is used to control the Servo Motor? 4 3 5

PART - C (5 × 12 = 60 Marks) — Marks BL CO

Answer **all** Questions

28. (a) With suitable waveform diagram and formula for duty cycle explain the operation of PWM. And write a simple Arduino sketch to glow a LED connected at Pin13 at 60% duty cycle. 12 3 1

(OR)

(b) With neat diagram explain the architecture of ATmega 328P.

29. (a) (i) List the pointer rules. (ii) Shows the use of pointers with a short program. 12 3 2

(OR)

(b) Write short notes on the following: (i) Structures (ii) Unions and (iii) Data storage

30. (a) Write a sketch for the Arduino master device in I^2C communication and explain. 12 4 3

(OR)

(b) Write a code to control LEDs using an IR sensor and a remote (Arduino) and explain with circuit arrangement.

31. (a) How timer is used in Fast PWM mode? Explain with code. 12 3 4

(OR)

(b) What are external interrupt? With code explain.

32. (a) Write a code to indicate the temperature in "Red", "Yellow", "Green" LEDs and also send the value to terminal in PC via serial port. 12 4 5

Note:

Red LED should glow when temperature is greater than 100 degree Celsius
Yellow LED should glow when temperature is greater than 51 degree Celsius and less than 100 degree Celsius
Green LED should glow when temperature is Less than 50 degree Celsius

(OR)

(b) How a DC Motor is interfaced using H-Bridge and controlled by a slide switch? With a code explain

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