

2021

PHYSICS — HONOURS

Paper : SEC-B-1

(Syllabus : 2019–20)

(Arduino)

Full Marks : 20

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

Answer **any ten** questions, each carrying **two** marks.

1. The program written in Arduino IDE is known as
(A) Command (B) Script
(C) Sketch (D) Code.
2. Number of digital pins available on the Arduino UNO board are
(A) 14 (B) 13
(C) 11 (D) 16.
3. The function delay (1000) counts
(A) 100 seconds (B) 1000 seconds
(C) 1 second (D) 1000 milliseconds.
4. The serial.begin() sets
(A) Serial communication (B) Baud rate for serial communication
(C) USB communication (D) GPIO communication.
5. The built-in LED on the Arduino UNO board is connected to
(A) Digital pin 13 (B) Analog pin A1
(C) Digital pin 5 (D) Analog pin A0.
6. The resolution of analogRead() is
(A) 4 mV (B) 4.9 mV
(C) 3.3 mV (D) 10 mV.

Please Turn Over

7. Which microprocessor is used in Arduino UNO board?
(A) ATmega2560 (B) ATmega328P
(C) ATmega32114 (D) AT91SAM3x8E.
8. What type of signal does the analogWrite() command produce when a pin is set to OUTPUT?
(A) Digital signal (B) Analog signal
(C) Amplitude modulated signal (D) Pulse width modulated signal.
9. What does the second parameter 'X' stands for in the function pinMode(pin, X)?
(A) ANALOG or DIGITAL (B) HIGH or LOW
(C) INPUT or OUTPUT (D) READ or WRITE.
10. Which command turns the on board LED on?
(A) digitalWrite(LED_BUILTIN, OUTPUT) (B) pinMode(LED_BUILTIN, HIGH)
(C) digitalWrite(LED_BUILTIN, OUTPUT) (D) digitalWrite(LED_BUILTIN, HIGH).
11. What will be the output of the following code?

```
int integer = 12;  
string str = "12";  
integer += 1;  
str += 1;
```


(A) 13, 13 (B) 13, 112
(C) 13, 12 (D) 13, 121.
12. The number of analog pins on Arduino UNO board are
(A) 1 (B) 5
(C) 6 (D) 9.
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2021

PHYSICS — HONOURS

(2019 - 20 Syllabus)

Paper : SEC-B-2

(Electrical Circuits and Network Skills)

Full Marks : 80

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

1. Answer **any ten** questions :

2×10

- (a) The main purpose of using a core in a transformer is to
 - (i) offer low reactance path to the magnetic flux
 - (ii) prevent eddy current loss
 - (iii) eliminate magnetic hysteresis
 - (iv) decrease iron loss.
- (b) The 3 Wattmeter method can be used to measure power in
 - (i) balanced circuit
 - (ii) unbalanced circuit
 - (iii) both balanced and unbalanced circuit
 - (iv) none of the above.
- (c) When an induction motor is at standstill, its
 - (i) stator field is stationary
 - (ii) stator frequency is zero
 - (iii) stator current is zero
 - (iv) supply frequency equals rotor frequency.
- (d) State the difference between slip ring rotor and squirrel cage rotor in an induction motor.
- (e) What is meant by electro-negativity of SF₆ gas?
- (f) State the effects of armature reaction in a DC machine.
- (g) How can eddy current loss be reduced?

Please Turn Over

- (h) What is the current in the phase (phase current) of a Y connected load where $E_L = 440V$ and $Z_p = 20\Omega$?
- (i) Can a single phase transformer be used for three phase applications?
- (j) What are the advantages of oil-circuit breaker (OCB) over other form of circuit breakers?
- (k) What are the main sources of transformer-loss?
- (l) Why does a single phase induction motor does not posses any starting torque?
- (m) Sketch the block diagram of a utility distribution sub-station.

Answer **any four** questions.

- 2. (a) Explain briefly how rotating magnetic field is produced in a three phase induction motor. (b) Draw the two wattmeter method connection for measurement of power in three phase system. 3+2
- 3. What is an ideal transformer? Draw and explain its phasor-diagram. 2+3
- 4. Using a schematic diagram, explain how does a protective relay work. 2+3
- 5. A 12 pole, 3 phase alternator driven by a speed of 500 rpm supplies power to a 8 pole, 3 phase induction motor. If the slip of the motor at full load is 3%, calculate the full-load speed of the motor. 5
- 6. Draw the torque-armature and speed-torque curves of a separately excited, series and shunt motor. Compare their performances and application areas. 3+2
- 7. (a) Compare between symmetric and unsymmetric fault in power system. (b) Explain why a relay is always connected to a Circuit-Breaker. 3+2
- 8. (a) Define Scott-T Transformer Connection and draw its phasor diagram. (b) Write down the effects of faults on transmission line. 3+2

Answer **any four** questions.

- 9. (a) State the construction of an induction type wattmeter using a diagram. (b) Explain its working principle and show how power and energy can be measured from it. 5+5
- 10. (a) Explain the working principle of a DC generator. (b) Name the two different type of armature windings in a DC generator and state their main differences. (c) Derive the e.m.f. equation of a DC generator using standard notation. 4+2+4

11. (a) Explain the operation of single phase induction motor using double revolving field theory.
(b) Explain any two methods of self-starting of a single phase induction motor. 6+4
12. (a) What are the two types of constructions commonly used in a power transformer? Compare these two types.
(b) What are the functions of Breathers and Conservators in a transformer?
(c) The primary winding of a 40Hz single phase transformer has 250 turns and is fed from a 440V supply. If the secondary winding has 20 turns, find the peak flux value in the core. 4+3+3
13. Write short notes on *any two* : ????
- (a) Meggar
(b) Oil Circuit Breaker
(c) Slip-torque characteristics of a three phase induction motor.
14. (a) What do you mean by switchgear? Name the different equipments used for switchgear. What are the different types of fuses based on application areas?
(b) What do you understand by Magnetising Current and Leakage Inductance in a transformer?
(c) Using a block diagram, explain how speed control of induction motor can be done using V/f method. (1+1+2)+2+4
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