

2025

PHYSICS — HONOURS

Paper : SEC-3A and SEC-3B

The figures in the margin indicate full marks.

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

Paper : SEC-3A

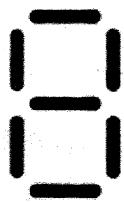
(Arduino)

Full Marks : 25

(Time : 1 Hour)

Answer *any five* questions.

1. (a) An LED is connected to pin 5. What will be the result observed for
digitalWrite(5, HIGH);
delay (1000);
digitalWrite (5, LOW)?
(b) A buzzer is connected to Pin3. Write down the command to make a sound for 2 seconds.
(c) Write the full form of LDR. 2+2+1

2. (a) Mark the segments of this 7-segment display block (in either common cathode or common anode mode). Which one should be OFF to write '0' in the block?

(b) Write the status of all the 7 pins to write '2' and 'b'. (2+1)+2

3. (a) What is the function of loop in any Arduino Program?
(b) What is the importance of the semicolon (;) in the syntax for Arduino programming language?
(c) Mention the names of four types of data-types used in Arduino programming. 1+2+2

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(5146+5114)

4. (a) Mention the name of one IR sensor you have used. Explain its pin configurations.
(b) What is the duty cycle? Find the relation between t^{on} and t^{off} when the duty cycle is 0.75.
(c) What is the basic use of Pin number 13 in the ARDUINO board? 2+2+1
5. (a) What is the function of the command `analogRead()`?
(b) According to PWM technique, what will be the corresponding values for 5V in `analogRead` and `analogWrite` mode?
(c) What is the use of `map` function in Arduino sketch? 1+2+2
6. (a) Name the microcontroller used on an Arduino Uno board. Write down the size of SRAM and flash memory used in that board.
(b) In Arduino Uno board, what are the available on-board voltages? Mention the frequency of the crystal oscillator used here. (1+2)+(1+1)
7. (a) Why is a driver needed to run the stepper motor instead of driving it directly by Arduino Uno?
(b) What are the header files needed to run Dot Matrix Display?
(c) What is the sensing range of HR-SC 501? 2+2+1
8. (a) What is the byte size of unsigned long variable?
(b) What are the functions of `millis()` and `Serial.begin (9600)` in an Arduino sketch?
(c) What is the working principle of DHT-11 for measuring humidity? 1+2+2

Paper : SEC-3B
(Introductory Data Analysis)
Full Marks : 25
(Time : 1 Hour)

Answer *any five* questions.

1. What are the basic differences in between data analysis and data analytics? What do you mean by data product? Give example. How are data product different from data set? 2+1+1+1
2. (a) What do you mean by nominal and ordinal scale? Explain with example.
 (b) Explain the statement – “The Celsius scale is an interval scale, while the Kelvin scale is a ratio scale.” (2+1)+2
3. What do you mean by population mean and sample mean? Discuss the physical significance of skewness of a statistical distribution. What is the value of skewness of a Gaussian distribution? 2+2+1
4. Define median and mode of a statistical distribution. What do you mean by cumulative frequency? How we can use cumulative frequency curve to calculate the median? 2+1+2
5. The table below gives the diastolic blood pressure (BP) of 250 men. The readings were made to the nearest millimeter and the central value of each group is given :

BP (mm)	60	65	70	75	80	85	90	95
No. of men :	4	5	31	39	114	30	25	2

Calculate from the data the mean, median and mode. 2+2+1

6. A group of 100 items has mean 60 and variance 25. If the mean of the first 50 items is 61 and the standard deviation is 4.5, find the mean and standard deviation of the other 50 items. 2+3
7. What do you mean by outliers in a data set? Calculate the standard deviation and identify the outliers in the following data set [52, 57, 57, 66, 66, 67, 67, 68, 69, 70, 70, 70, 72, 73, 75, 75, 76, 76, 78, 79, 89]. 1+2+2

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8. The Table below gives the frequency distribution of the measurement of length of an object :

Sr. No.	Length (cm)	Frequency
1.	3.50 – 3.51	4
2.	3.51 – 3.52	7
3.	3.52 – 3.53	13
4.	3.53 – 3.54	15
5.	3.54 – 3.55	8
6.	3.55 – 3.56	3

Write the table of cumulative frequency of the measurements. Also calculate the mean and mode of the distribution.

1+2+2