Practice Question Set For A-Level
Subject : Physics
Paper-1 Topic :7_ Magnetic Field

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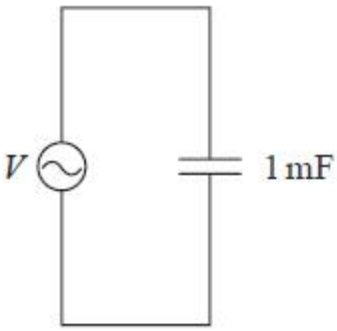
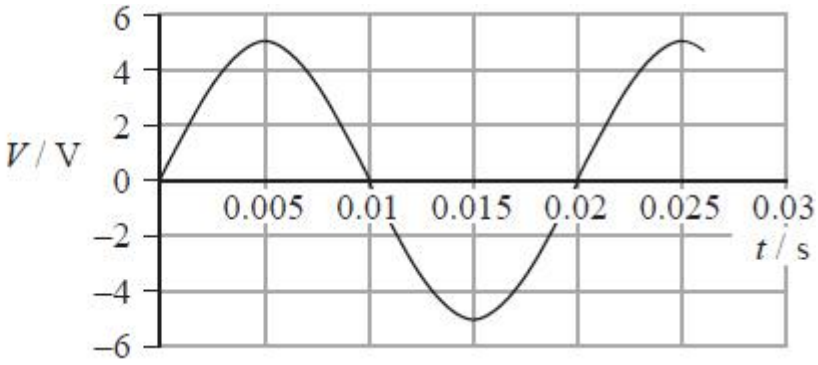
Student:_____
Max. Marks : 18 Marks **Time : 18 Minutes**

Q1.

The circuit shows a 1 mF capacitor connected to an a.c. supply. The graph shows how the potential difference *V* varies with time *t*.





(i) Calculate the root-mean-square potential difference.

(1)

.....

Root-mean-square potential difference = ...

(ii) The formula used to generate this graph is $V = 5 \sin (100 \pi t)$

Explain why this formula leads to the graph above.

(3)

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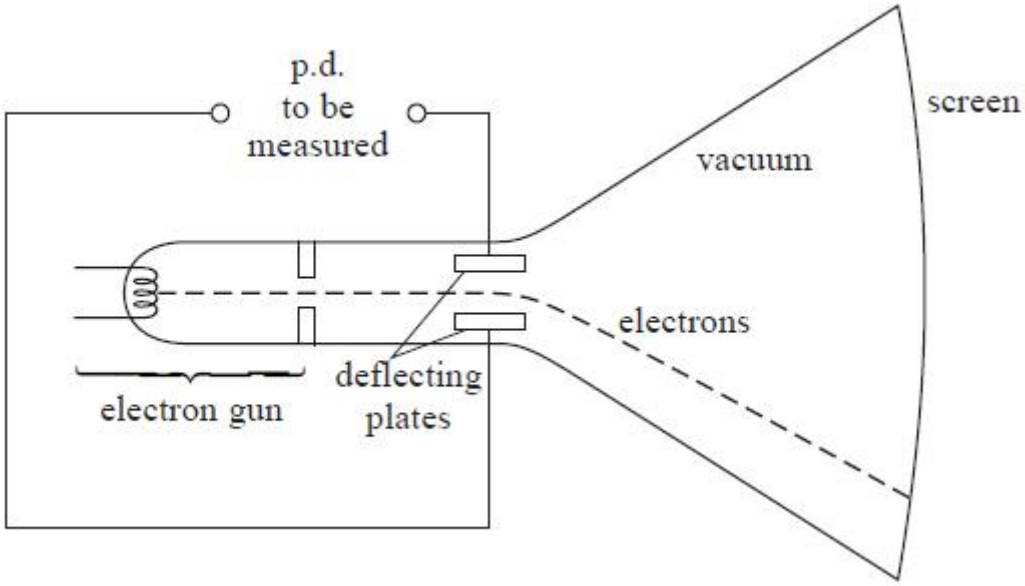
(Total for question = 4 marks)

Q2.

Cathode ray tubes are used in oscilloscopes.

The diagram shows a simplified cathode ray tube that can be used to determine the magnitude and polarity of a potential difference (p.d.).

The cathode ray tube consists of an electron gun, a pair of deflecting plates and a fluorescent screen.



(a) The electron gun includes a filament. When this filament is heated, electrons are released and are accelerated by a p.d. of 1.5 kV to form an electron beam.

(i) Name the process by which electrons are released from the heated filament.

(1)

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(ii) Show that the maximum velocity of the electrons is about 2×10^7 m s^{-1}.

(2)

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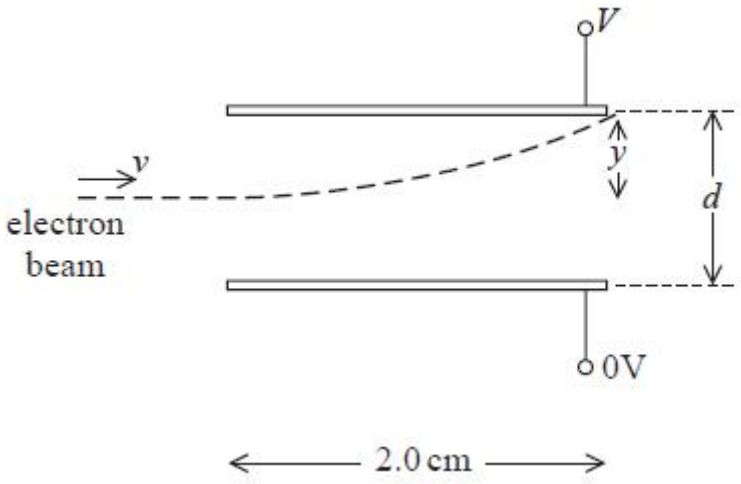
(b) The electron beam then enters a uniform electric field between the two parallel horizontal deflecting plates. The magnitude and direction of the deflection is determined by the p.d. *V* that is applied across the plates.

The diagram shows one possible path of the electron beam as it passes between the plates.



(i) Show that the acceleration of an electron, of mass *m* and charge *Q*, is given by

$$\frac{VQ}{dm}$$

(2)

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(ii) Calculate the magnitude of the vertical deflection y of the beam as it leaves the plates.
V = 50 V
d = 0.01 m

(5)

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y = ...

(c) A laboratory oscilloscope with the time base turned off operates in the same way as this simplified cathode ray tube. A student uses an oscilloscope in this way to monitor an alternating p.d. of 53 V_{rms}

On the grid, draw the trace that would be seen on the screen.

(4)

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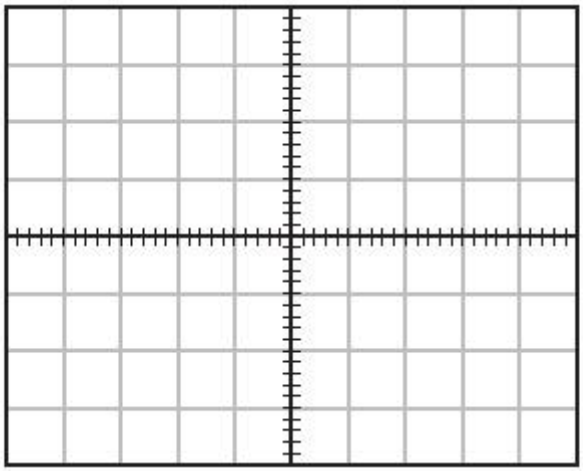

1 square = 25 V

(Total for question = 14 marks)