Name of the Student:_____
Max. Marks : 17 Marks **Time : 17 Minutes**

Mark Schemes

Q1.

<table>
<tr><th>Question Number</th><th>Acceptable Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>*</td><td>This question assesses a student's ability to show a coherent and logical structured answer with linkage and fully-sustained reasoning
Indicative content:
IC1 As the magnet moves through the coil there is a change in magnetic flux linkage (with coil)
Or as the magnet moves through the coil the coil cuts (lines of) magnetic flux
Or as the magnet moves through the coil the coil cuts magnetic field lines
IC2 An e.m.f. is induced across the coil
IC3 This generates a current in the (capacitor) circuit
IC4 The diode only allows current in one direction
IC5 So capacitor is charged (repeatedly)
IC6 When switch is closed capacitor discharges through the LED</td><td>Marks are awarded for indicative content and for how the answer is structured and shows lines of reasoning.
The following table shows how the marks should be awarded for indicative content.
<table><tr><th>Number of indicative marking points seen in answer</th><th>Number of marks awarded for indicative marking points</th></tr><tr><td>6</td><td>4</td></tr><tr><td>5–4</td><td>3</td></tr><tr><td>3–2</td><td>2</td></tr><tr><td>1</td><td>1</td></tr><tr><td>0</td><td>0</td></tr></table><table><tr><th></th><th>Number of marks awarded for structure of answer and sustained line of reasoning</th></tr><tr><td>Answer shows a coherent and logical structure with linkages and fully sustained lines of reasoning demonstrated throughout</td><td>2</td></tr><tr><td>Answer is partially structured with some linkages and lines of reasoning</td><td>1</td></tr><tr><td>Answer has no linkages between points and is unstructured</td><td>0</td></tr></table>
Total marks awarded is the sum of marks for indicative content and the marks for structure and lines of reasoning
<table><tr><th>IC points</th><th>IC mark</th><th>Max linkage mark</th><th>Max final mark</th></tr><tr><td>6</td><td>4</td><td>2</td><td>6</td></tr><tr><td>5</td><td>3</td><td>2</td><td>5</td></tr><tr><td>4</td><td>3</td><td>1</td><td>4</td></tr><tr><td>3</td><td>2</td><td>1</td><td>3</td></tr><tr><td>2</td><td>2</td><td>0</td><td>2</td></tr><tr><td>1</td><td>1</td><td>0</td><td>1</td></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td></tr></table></td><td>6</td></tr>
</table>

Q2.

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<tr><td>*</td><td>
<table>
<tr><th>IC points</th><th>IC mark</th><th>Max linkage mark</th><th>Max final mark</th></tr>
<tr><td>6</td><td>4</td><td>2</td><td>6</td></tr>
<tr><td>5</td><td>3</td><td>2</td><td>5</td></tr>
<tr><td>4</td><td>3</td><td>1</td><td>4</td></tr>
<tr><td>3</td><td>2</td><td>1</td><td>3</td></tr>
<tr><td>2</td><td>2</td><td>0</td><td>2</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>1</td></tr>
<tr><td>0</td><td>0</td><td>0</td><td>0</td></tr>
</table>
Indicative content:
IC1 Alternating p.d. causes an alternating current in the coil
IC2 Current carrying conductor in a magnetic field experiences a force
IC3 Current is alternating, so force changes direction with current (same frequency)
Or the alternating current drives the cone at the frequency of the p.d.
</td><td>
This question assesses a student's ability to show a coherent and logically structured answer with linkages and fully sustained reasoning.

Marks are awarded for indicative content and for how the answer is structured and shows lines of reasoning.

The table shows how the marks should be awarded for indicative content and structure and lines of reasoning.
<table>
<tr><th>Number of indicative marking points seen in answer</th><th>Number of marks awarded for indicative marking points</th></tr>
<tr><td>6</td><td>4</td></tr>
<tr><td>5–4</td><td>3</td></tr>
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<tr><td>Answer shows a coherent and logical structure with linkages and fully sustained lines of reasoning demonstrated throughout</td><td>2</td></tr>
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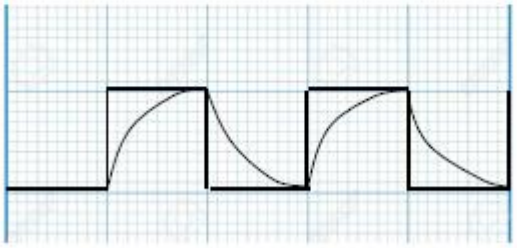
</table>
Alternative to first 3 indicative content points:
IC1 Current in coil causes a magnetic field

IC2 Current is alternating so field changes direction with current (same frequency)

IC3 Field interacts with permanent magnet's field so coil experiences oscillating force
</td><td></td></tr>
<tr><td></td><td>
IC4 The loudspeaker forces the box into oscillation
IC5 (At certain frequencies) the frequency of oscillation equals the natural frequency of oscillation of the air in the box
IC6 Maximum energy is transferred and the amplitude of vibration of the box increases
</td><td>
IC6 Resonance occurs and the amplitude of vibration of the box increases
</td><td>6</td></tr>
</table>

Q3.

Question Number	Acceptable answers		Additional guidance	Mark
	• Time axis: one cycle = 50 OR two cycles =100	(1)	Example of calculation $T = 1/f = 1/20\ Hz = 0.050\ s$ Two cycles $= 2 \times 0.050\ s = 0.10\ s = 100\ ms$ Time Constant $= 100 \times 50 \times 10^{-6} = 0.005\ s$ In half a cycle (0.025 s) there are 0.025 s / 0.005 s = 5 Time constants	5
	• Use of time constant = *RC*	(1)		
	• Charging curve, from 25 ms to 50 ms, just about reaching 5V as shown (ecf from their T)	(1)	Ignore anything drawn in the first half cycle 	
	• One corresponding discharge curve	(1)		
	• Curve should look exponential	(1)	Time period should be marked 50 ms or equivalent	