رقم الورقة	
رقم المغلف	

حاضر ⬭

غائب ⬭

سلطنة عمان

وزارة التربية والتعليم

امتحان شهادة دبلوم التعليم العام للمدارس الخاصة (ثنائية اللغة)

للعام الدراسي ١٤٣٤/١٤٣٣ هـ - ٢٠١٢ / ٢٠١٣ م

الدور الأول - الفصل الدراسي الأول

تنبيه:
- المادة: الفيزياء (ثنائية اللغة).
- الأسئلة في (١٤) صفحة.
- زمن الإجابة: ثلاث ساعات.
- الإجابة في الورقة نفسها.

تعليمات وضوابط التقدم للامتحـان:

- الحضور إلى اللجنة قبل عشر دقائق من بدء الامتحان للأهمية.
- إبراز البطاقة الشخصية لمراقب اللجنـة.
- يمنع كتابة رقم الجلوس أو الاسم أو أي بيانات أخرى تدل على شخصية الممتحن في دفتر الامتحان، وإلا ألغي امتحانه.
- يحظر على الممتحنين أن يصطحبوا معهم بمركز الامتحان كتبا دراسية أو كراسات أو مذكرات أو هواتف محمولة أو أجهزة النداء الآلي أو أي شيء له علاقة بالامتحان كما لا يجوز إدخال آلات حادة أو أسلحة من أي نوع كانت أو حقائب يدوية أو آلات حاسبة ذات صفة تخزينية.
- يجب أن يتقيد المتقدمون بالزي الرسمي (الدشداشة البيضاء والمصر أو الكمة للطلاب والدارسين والزي المدرسي للطالبات واللباس العماني للدارسات) ويمنع النقاب داخل المركز ولجان الامتحان.
- لا يسمح للمتقدم المتأخر عن موعد بداية الامتحان بالدخول إلا إذا كان التأخير بعذر قاهر يقبله رئيس المركز وفي حدود عشر دقائق فقط.
- يتم الالتزام بالإجراءات الواردة في دليل الطالب لأداء امتحان شهادة دبلوم التعليم العام.
- يقوم المتقدم بالإجابة عن أسئلة الامتحان المقالية بقلم الحبر (الأزرق أو الأسود).
- يقوم المتقدم بالإجابة عن أسئلة الاختيار من متعدد بتظليل الشكل (⬭) وفق النموذج الآتي:

س - عاصمـة سلطنة عمـــان هي:

⬭ القاهرة ⬭ الدوحة

⬬ مسقط ⬭ أبوظبي

ملاحظة: يتم تظليل الشكل (⬬) باستخدام القلم الرصاص وعند الخطأ، امسح بعناية لإجراء التغيير.

صحيح ⬬ **غير صحيح** ⬭ ◉ ◒ ⊠ ☑

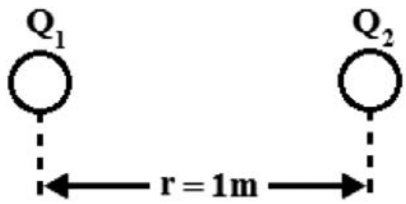
Question 1 (28 marks)

There are 14 multiple–choice items worth two marks each.
Shade the best correct answer for each of the following items.

1. Two charged objects (A) and (B) are originally neutral. When rubbed together, (A) transfers electrons to (B). The types of charges on (A) and (B) will be:

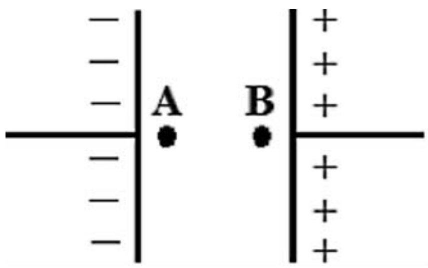
	Type of charge on (A)	Type of charge on (B)
▢	Positive	Positive
▢	Negative	Positive
▢	Positive	Negative
▢	Negative	Negative

2. The diagram opposite shows two charges.
The electrical net force affecting on (Q_1) due to (Q_2) is (F).
If each charge was doubled, what must be the distance between the charges which make the force equal to ($\frac{F}{9}$)?



▢ 3 m ▢ 6 m
▢ 9 m ▢ 36 m

3. The diagram opposite shows two charged parallel plates.
The correct answer which describes the Potential difference (V) and the Electric field ($\vec{E}$) of points (A) and (B) is :

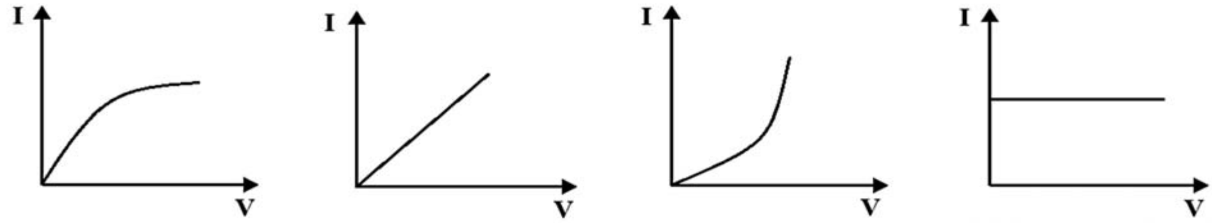


▢	$V_A > V_B$	$E_A > E_B$
▢	$V_A < V_B$	$E_A < E_B$
▢	$V_A > V_B$	$E_A = E_B$
▢	$V_A < V_B$	$E_A = E_B$

4. A Copper wire has a radius of (4.85×10^{-4} m) carries a current of (1 A). If the Copper wire contains (8.4×10^{28} free electrons/m^3), the electron drift velocity is approximately:

- ☐ 1×10^{-23} m/s
- ☐ 1×10^{-4} m/s
- ☐ 1×10^{3} m/s
- ☐ 1×10^{8} m/s

5. The graph that represents the current-voltage relationship of a shining light bulb is:



☐ ☐ ☐ ☐

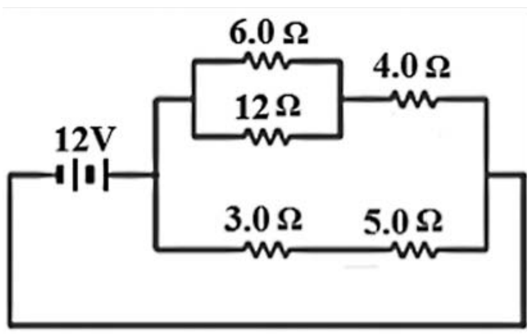
6. A lamp is connected to a (6 V) power supply. If a current of (0.3 A) passes through it in (2 min), then the electrical energy transferred is equal to:

- ☐ 0.6 J
- ☐ 3.6 J
- ☐ 108 J
- ☐ 216 J

7. The unit of e.m.f is equivalent to:

- ☐ T.m.s
- ☐ $T.m^2.s$
- ☐ T.m/s
- ☐ $T.m^2/s$

8. 8- The diagram below shows five resistors connected with a (12 V) battery.



The current in the (4.0 Ω) resistor is:

- ☐ 0.5 A
- ☐ 1 A
- ☐ 1.5 A
- ☐ 3 A

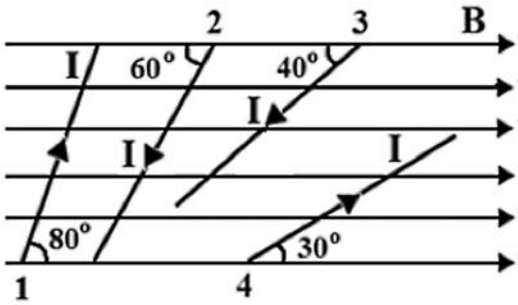
9. A capacitor of (20 μF) is charged from (6 V) supply. Its stored energy is:

- ▢ 1.2×10^{-4} J
- ▢ 3.6×10^{-4} J
- ▢ 6.0×10^{-4} J
- ▢ 7.2×10^{-4} J

10. Two identical capacitors are connected in parallel and the combination is connected in series to a third identical capacitor.
The equivalent capacitance of this arrangement is:

- ▢ 3C
- ▢ 2C
- ▢ $\frac{3C}{2}$
- ▢ $\frac{2C}{3}$

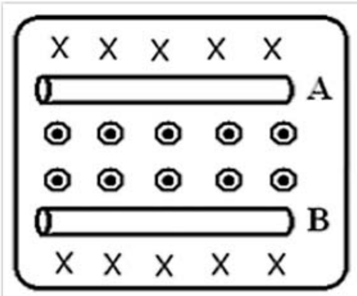
11. Four identical wires 1, 2, 3 and 4 carrying the same current are located in a uniform magnetic field as shown opposite.
Which wire has the minimum magnetic force?



- ▢ 1
- ▢ 2
- ▢ 3
- ▢ 4

12. The magnetic field due to the current-carrying conductors (A) and (B) is as shown in the opposite diagram.

The direction of the current in each conductor is flowing to:



	Conductor (A)	Conductor (B)
▢	Right	Left
▢	Right	Right
▢	Left	Right
▢	Left	Left

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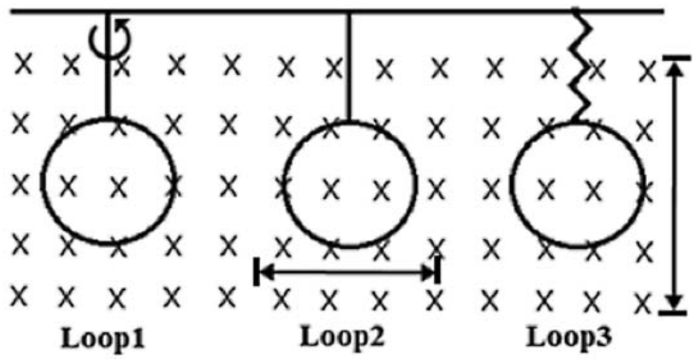
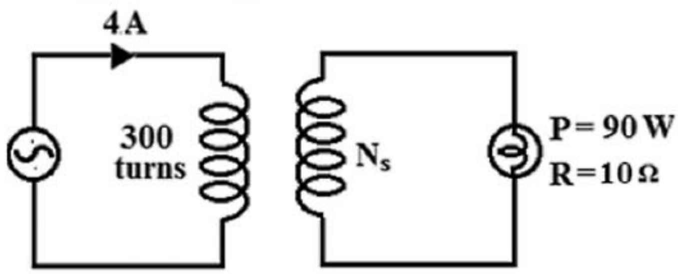
13. Three loops of wires are all moved in a uniform magnetic field as shown below.



Which loop have a changing magnetic flux? (the arrows indicate the direction of motion).

- Loop 1 only
- Loop 2 only
- Loop 3 only
- All of them

14. The diagram below shows the structure of an ideal transformer.



What is the number of turns in the secondary coil?

- 225 turns
- 300 turns
- 400 turns
- 900 turns

Extended Questions

Write your answer for each of the three questions in the constructed–response section in the space provided.

Be sure to show all your work, including the correct units where applicable.

Question 2 (14 marks)

A) 1. Define the electric field strength $\vec{E}$. (2 marks)

2. Explain why the polythene become negative charged when it's rubbed by a duster? (1 mark)

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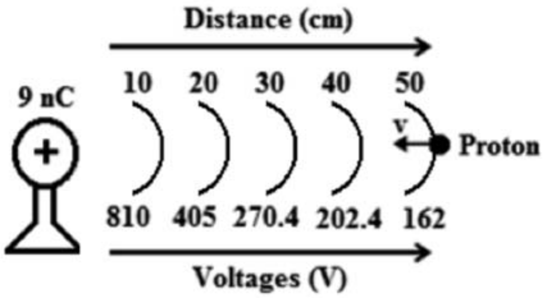
3. The diagram below shows a metal ball carrying a positive charge of (9 nC) held by an insulating support.
The scale in front of the metal ball is showing the voltage and the distance from the metal ball.



If a proton is entered the regain at a distance of (50 cm) away from the ball with a force of (1.44×10^{-16} N), calculate:

i) The distance at which the proton will stop from the metal ball . (2 marks)

ii) The energy lost by a charge of (2 nC) which was put at a distance of (20 cm) and moved to a distance of (30 cm). (2 marks)

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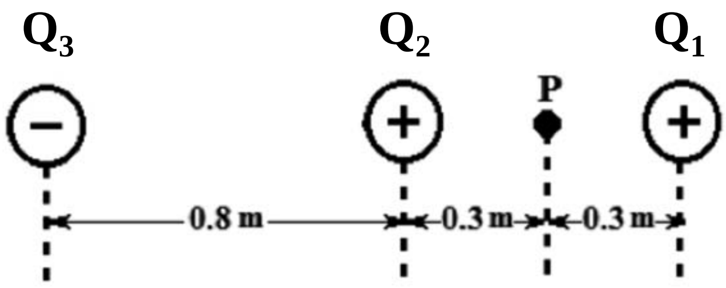
B) The figure below shows three charges (Q_1 = 2 nC), (Q_2 = 3 nC) and (Q_3= −4 nC), on the same line.



1. Determine in which direction must (Q_3) be moved (towards or away) from (Q_2) to make the point (P) at equilibrium of the electric field strength.

(1 mark)

2. Calculate the distance at which (Q_3) will be moved to make point (P) at equilibrium.

(2 marks)

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C) **1.** State Ohm's law. (2 marks)

2. A nichrome wire has a length of (0.7 m) and a resistance of (17 Ω).

Find out the radius of the wire if the resistivity of the nichrome is (1.1×10^{-6} Ωm).

(2 marks)

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Question 3 (14 marks)

A) **1.** Define:

i) The electrical potential difference between two points. (1 mark)

ii) The electrical power. (1 mark)

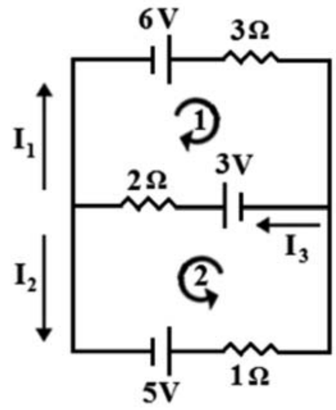
2. A lamp of (60 W, 120 V) was turned on for (10 hours).
How many coulombs of charge passed through it?

(2 marks)

B) The circuit opposite shows 3 currents flowing in it.

1. State Kirchhoff's 1st law.

(2 marks)



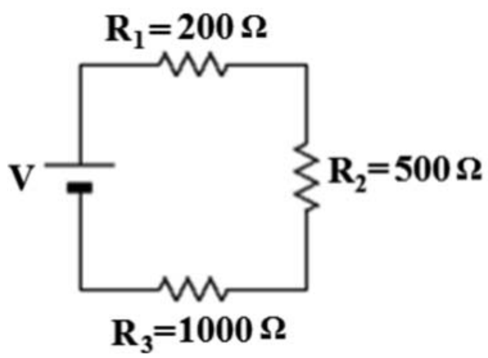
2. Find out (I_1) and (I_2) if (I_3 = 3 A)

(3 marks)

3. The circuit opposite shows three resistors (R_1), (R_2), and (R_3) connected with a (6.0 V) supply.

Find out the potential divider of (R_3).

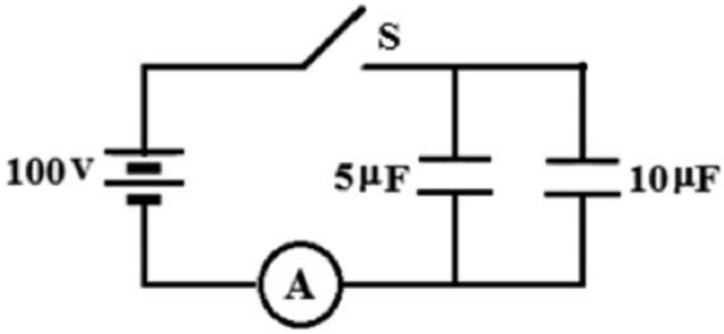
(2 marks)



C) **1.** Define capacitance. (1 mark)

2. From the diagram below calculate how many coulombs of charge passes through the ammeter (A) after the switch (S) is closed?

(2 marks)



Question 4 (14 marks)

A) 1. The diagram below shows two carrying current conductors.
Draw the magnetic field lines around them showing their direction.

(1 mark)

2. A proton traveling perpendicularly to a magnetic field of (1.5 T).

The force exerted on the proton due to the magnetic field is (4.32×10^{-12} N).

i) Calculate the velocity of the proton. (1 mark)

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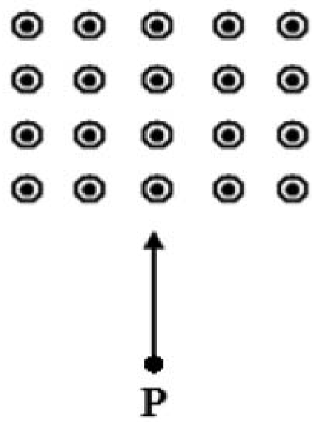
ii) If the proton is going north in an upward-direction magnetic field as shown opposite, determine the direction of the magnetic force on the proton. (1 mark)



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3. What is the strength of a magnetic field that exerts a force of (2.5×10^{-4} N) on each meter of a wire carrying (5 A) of current perpendicular to the field?

(2 marks)

____

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____

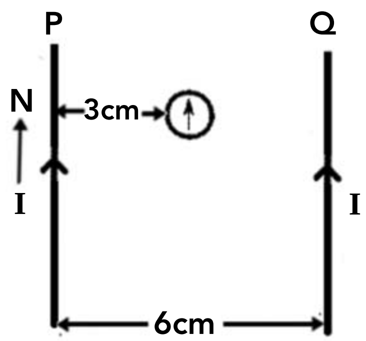
____

____

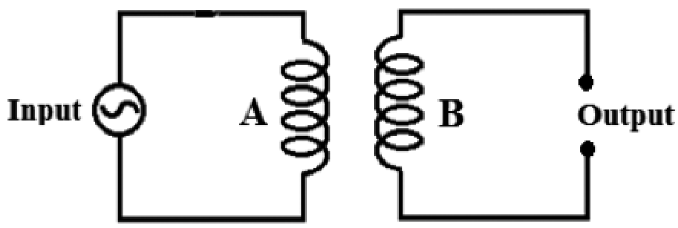
B) 1. Define Magnetic flux. (1 mark)

2. State Faraday's Law. (1 mark)

3. Two carrying current wires (P) and (Q), are placed parallel to each other. A compass is placed between them. In which direction will the compass needle point to? (2 marks)



C) 1. The diagram below shows a simple transformer.



i) Explain how the energy loss in a transformer can be reduced. (1 mark)

ii) Calculate the output current if the input current is (30 A), and the turns ratio of the transformer is (A:B) = (1:450) (2 marks)

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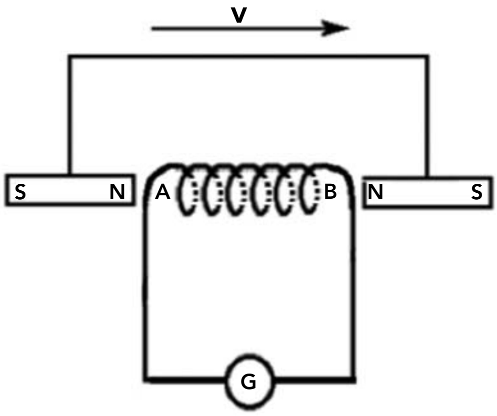
2. The diagram below shows a moving magnetic bars and a solenoid. If the bars are moved to the right, determine the poles of the solenoid at points (A) and (B)? (2 marks)

A: ______________________________

B: ______________________________



Good Luck

END OF EXAMINATION

FORMULA AND CONSTANTS

Forces and charge	Electricity
$F = K\dfrac{Q_1 Q_2}{r^2}$ $E = K\dfrac{Q}{r^2}$ $E = \dfrac{V}{d} = \dfrac{F}{Q}$ $v\ or\ \varepsilon = \dfrac{W}{Q}$ $KE = \dfrac{1}{2}mv^2$ $\dfrac{1}{2}mv^2 = eV$ $W = q\Delta V$	$I = nAev = \dfrac{\Delta Q}{\Delta t}$ $V = IR$ $R = \rho\dfrac{L}{A}$ $P = VI = I^2R = \dfrac{V^2}{R}$ $W = VIt$ $W = \dfrac{1}{2}QV = \dfrac{1}{2}CV^2$ $\Sigma\varepsilon = \Sigma IR$ $V = \varepsilon - Ir$ $R = R_1 + R_2$ $\dfrac{1}{R} = \dfrac{1}{R_1} + \dfrac{1}{R_2}$ $C = C_1 + C_2$ $\dfrac{1}{C} = \dfrac{1}{C_1} + \dfrac{1}{C_2}$ $C = \dfrac{Q}{V}$ $V_{out} = V_{in}\dfrac{R_1}{R_1 + R_2}$
Magnetic forces and fields	
$F = BIL\sin\theta$ $\dfrac{F}{L} = \dfrac{\mu_o I_1 I_2}{2\pi r}$ $F = Bqv$	
Constants	**Electromagnetic induction**
$e = 1.6\times10^{-19}C$ $K = 9\times10^9 N.m^2/C^2$ $\mu_\circ = 4\pi\times10^{-7}T.m/A$ $m_{proton} = 1.673\times10^{-27}kg$	$\Phi = NAB$ $\varepsilon = -N\dfrac{\Delta\phi}{\Delta t}$ $\dfrac{V_s}{V_p} = \dfrac{N_s}{N_p} = \dfrac{I_p}{I_s}$

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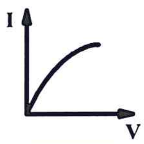
Physics 2012/2013 Bilingual Exams

1st semester , 1st session

Model Answers

Answer of Question One:(28 marks)

item	answer	answer	mark
1	C	Positive negative	2
2	B	6 m	2
3	D	$V_A < V_B$, $E_A = E_B$	2
4	B	1×10^{-4} m/s	2
5	A		2
6	D	216 J	2
7	D	T.m^2/s	2
8	C	1.5A	2
9	B	3.6×10^{-4} J	2
10	D	2C/3	2
11	D	4	2
12	C	Left right	2
13	A	Loop 1 only	2
14	C	400 turns.	2

Answer of Question Two:(14 marks)

item	answer	mark
(A) 1	The force per coulomb exerted on a positive charge placed at that point in the field .	2
(A) 2	Because the electrons transfers from the duster to the polythene when they rubbed together.	1
(A) 3.I	The proton will stop when the forces are equal. $= 9 \times 10^9 \times \frac{9\times10^{-9}\times1.6\times10^{-19}}{r^2} = 1.44 \times 10^{-16}$ $r^2 = \frac{1.296 \times 10^{-17}}{1.44 \times 10^{-16}}$ $r = 0.3m = 30cm$	 1 $\frac{1}{2}$ $\frac{1}{2}$
(A) 3.II	$\because W = q\,\Delta V$ $\therefore W = 2 \times 10^{-9} \times (270.4 - 405)$ $= -2.69 \times 10^{-7}$J	 1 1

Answer of Question Two:(14 marks)

item	answer	mark
(B) 1	Q_3 must be moved toward Q_2.	1
(B) 2	To get the equilibrium of electric field strength at point P . $\because E_2 - E_1 - E_3 = 0$ $\therefore E_2 = E_1 + E_3$ $\therefore K\dfrac{Q_2}{r_2^2} = K\dfrac{Q_1}{r_1^2} + K\dfrac{Q_3}{r_3^2}$ $300 = 200 + 9 \times 10^9 \times 4 \times 10^{-9}/\, r_3^2$ $r_3 = 0.6$ m $\therefore$ The distance is : 1.1 – 0.6 = 0.5 m	 $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$
(C) 1	The current through a metal wire is directly proportional to the p.d. across it when the temperature remains constant.	2
(C) 2	$R = \dfrac{\rho l}{A} \Rightarrow A = \dfrac{\rho l}{R}$ $= \dfrac{(1.1X10^{-6})(0.7)}{17}$ $= 4.5X10^{-8}\, m^2$ $\because A = \pi r^2 \Rightarrow r^2 = \dfrac{A}{\pi}$ $= \dfrac{4.5X10^{-8}}{3.14} = 1.4X10^{-8}\, m^2$ $\therefore r = \sqrt{1.4\times10^{-8}} = 1.2\times10^{-4}\, m$	 $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$

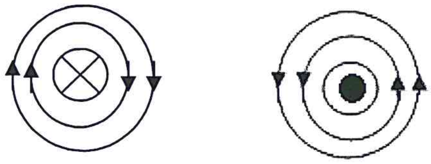
Answer of Question Three: (14 marks)

item	answer	mark
(A) 1.I	the electrical potential energy transferred to other forms, per coulomb of charge that passes between the two points.	1
(A) 1.II	The electrical Power is the rate at which electric energy is transferred.	1
(A) 2	$p = IV \Rightarrow I = \dfrac{P}{V}$ $= \dfrac{60}{120} = 0.5A$ $\because Q = It$ $\therefore Q = 0.5 \times (10 \times 60 \times 60) = 1.8 \times 10^4 C$	½+ ½ ½+ ½
(B) 1	Kirchhoff's1st law: "the sum of the currents flowing into a point equals the sum of the currents flowing out of that point".	2
(B) 2	$\because I_3=I_1+I_2 \rightarrow (1)$ From Loop 1: $6-3I_1+3-2I_3=0$ $6-3I_1+3-6=0$ $3I_1=3$ $\therefore I_1=1A$ From equation (1): $I_2= I_3-I_1$ $\therefore I_2= 3-1=2A$. Another answer from Loop 2: $5-1I_2+3-2I_3=0$ 1 $5-I_2+3-6=0$ $I_2=2A$ 1 Then: $I_1=I_3-I_2=3-2=1A$ 1	½ ½ 1 1

Answer of Question Three: (14 marks)

(B) 3	$V_{out} = \dfrac{V_{in}.R_3}{R_1+R_2+R_3}$ $V\ out = \dfrac{6X1000}{200+500+1000} = \dfrac{6000}{1700}$ $\therefore V\ out = 3.5V$	1 1
(C) 1	The capacitance is the ability of the capacitor to store charge on its plates.	1
(C) 2	$\because C = C_1 + C_2 = 5\mu F + 10\mu F$ $\therefore C = 15\mu F$ $\because Q = CV$ $\therefore Q = (15\times10^{-6})(100) = 1.5\times10^{-3}\,C$ $= 0.0015C$	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$

Answer of Question Four: (14 marks)

item	answer	mark
(A) 1		1
(A) 2.I	$\because v=\frac{F}{Bq}$ $=\frac{4.32\times10^{-12}}{1.5\times1.6\times10^{-19}}$ $=1.8\times10^{7}\,m/s$	 ½ ½
(A) 2.II	To the east **or** to the right.	1
(A) 3	$\because B=\frac{F}{I\ell}$ $=\frac{2.5\times10^{-4}}{5\times1}$ $=5\times10^{-5}\,T$	 1 1
(B) 1	The total number of lines of flux that link or pass at 90^{o} through a given area	1
(B) 2	The magnitude of the induced e.m.f is equal to the rate of change of flux linkage.	1

Answer of Question Four: (14 marks)

(B) 3	To north	2
(C) 1.I	To reduce the energy loss in a transformer the core is made of thin sheets of iron called laminations, separated by insulating material.	1
(C) 1.II	$\frac{N_s}{N_p} = \frac{I_p}{I_s} \Rightarrow I_s = \frac{30 \times 1}{450}$ $\therefore I_s = 0.067A$	1 1
(C) 2	A: North B: South	1 1

End of Answer Model