Transformations & Transmission of Electrical

Energy

Mark Scheme 2

Level	International A Level
Subject	Physics
Exam Board	CIE
Торіс	Alternating Currents
Sub Topic	Transformers & Transmission of Electrical Energy
Paper Type	Theory
Booklet	Mark Scheme 2

Time Allowe	d:	51 minutes	51 minutes /42					
Score:		/42						
Percentage:		/100						
A*	А	В	С	D	E	U		
>85%	'77.5%	70%	62.5%	57.5%	45%	<45%		

1	(a	all four diodes correct to give output, regardless of polarity connected for correct polarity			[2]
	(b)) N _s V _c	$S / N_{\rm P} = V_{\rm S} / V_{\rm P}$ $= \sqrt{2} \times V_{\rm rms}$ tic. = 0.0 / ($\sqrt{2} \times 240$)	C1 C1	
		Id	= 1/38 or 1/37 or 0.027	A1	[3]
2	(a)	(i)	flux/field in core must be changing M1 so that an e.m.f./current is induced in the secondary A1 [2]		
		(ii)	power = VI M1 <u>output</u> power is constant so if V_s increases, I_s decreases A1 [2]		
	(b)		same shape and phase as I_P graph B1 [1]		
		(ii)	same frequency M1 correct phase w.r.t. Fig. 6.3 A1 [2]		

(iii) $\frac{1}{2}\pi \operatorname{rad}$ or 90°

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B1

[1]

3	(a	(i)	<i>either</i> heating effect in a resistor \propto (current) ² square of value of an alternating current is always positive so heating effect <i>or</i> current moves in opposite directions in resistor during half-cycles heating effect is independent of direction	B1 B1 A0 (B1) (B1)	[2]
		(ii)	that value of the direct current producing the same heating effect (as the alternating current) in a resist	M1 for A1	[2]
	(b)	(i)	induced e.m.f. proportional to the rate of change of (magnetic) flux (linkage)	M1 A1	[2]
		(ii)	flux in core is in phase with current in the primary coil (induced) e.m.f. in secondary because coil cuts the flux flux and rate of change of flux are not in phase	B1 B1 B1	[3]
4	(a)	(i)	e.m.f. induced proportional / equal to rate of change of (magnetic) flux (linkage)	M1 A1	[2]
		(ii)	e.m.f. (induced) only when flux is changing / cut direct current gives constant flux	B1 B1	[2]
	(b)	(i)	(induced) e.m.f. / current acts in such a direction <u>to produce effects</u> to oppose the change causing it	B1 B1	[2]
		(ii)	(induced) current in <u>secondary</u> produces magnetic field opposes (changing) field produced in <u>primary</u> so not in phase	M1 M1 A0	[2]
	(c)	(i)	alternating means that voltage / current is easy to change	B1	[1]
		(ii)	high voltage means less power / energy loss (during transmission)	B1	[1]
	[Total: 10]				

5	(a	(i)	either prevent loss of magnetic flux or improves flux linkage with secondary	B1	[1]
		(ii)	<u>reduces</u> eddy current (losses) <u>reduces</u> losses of energy (in core)	B1 B1	[2]
	(b)	(i)	(induced) e.m.f. proportional to / equal to rate of change of (magnetic) flux (linkage)	M1 A1	[2]
		(ii)	changing current in primary gives rise to(1)changing flux in core(1)flux links with the secondary coil(1)changing flux in secondary coil, inducing e.m.f.(1)		
	(c)	e.g.	(any three, 1 each to max 3) . can change voltage easily / efficiently	B3	[3]
	. ,	(anj	high voltage transmission reduces power losses y two sensible suggestions, 1 each)	B2	[2]

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