

ENGINEERING TRIPOS PART IIA

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2 May 2012 9.00 to 10.30

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Module 3B7

PRESENT AND FUTURE ENERGY SYSTEMS

*Answer not more than **three** questions.*

*All questions carry the same number of marks.*

*The approximate percentage of marks allocated to each part of a question is indicated in the right column.*

*Attachment: 3B7 Factsheet (3 pages in colour)*

STATIONERY REQUIREMENTS

Single-sided script paper

SPECIAL REQUIREMENTS

Engineering Data Book

CUED approved calculator allowed

**You may not start to read the questions printed on the subsequent pages of this question paper until instructed that you may do so by the Invigilator**

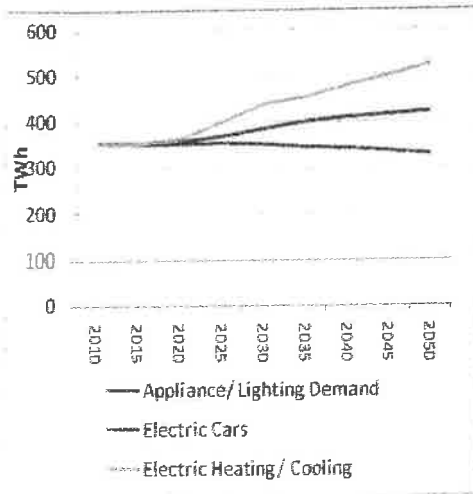
- 1 Describe the engineering challenge represented by any attempt to meet the target of the Climate Change Act of 2008 - namely to have a low carbon economy that has achieved an 80% reduction in the emissions of carbon dioxide in the UK from those levels that prevailed in 1990. [100%]
- 2 Describe the ways in which the UK electricity grid must change by 2050 if we are to have a low carbon economy with an 80% reduction in the emissions of carbon dioxide from those levels that prevailed in 1990, while simultaneously meeting requirements for sustainability, security of supply and affordability? [100%]
- 3 What interventions can be made to improve the energy efficiency of the UK building stock? What is the scale of the exercise that must be undertaken, and what fraction of total UK energy usage is it estimated could be saved? [100%]
- 4 What strategies can be applied to the reduction of energy used in transport, and the resulting emissions of carbon dioxide over the next 40 years? [100%]

**END OF PAPER**

3B7 PRESENT AND FUTURE ENERGY SYSTEMS – a three-sided fact sheet.

(1) According to DECC, the CO<sub>2</sub> emissions in the UK in 1990 were 590 million tonnes of CO<sub>2</sub> equivalent. This figure dropped steadily until recent years, and the data for 2008-10 are as follows: 2008 521Mt, 2009 474Mt, 2010 492Mt.

(2) Total electrical energy consumption trends from National Grid: three scenarios.



- Decline in use for appliances & lighting despite increasing household numbers
  - From LED lighting and A rated smarter appliances
- Increased electrification of transport when battery issues are resolved
- Home heating shifts to heat pumps
  - Off gas grid properties retrofitted initially
  - Gas properties switch to heat pumps for base load heat later

Electricity Profile 2010-2050 from National Grid

