UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2011/2012

COURSE NAME	:	ENERGY MANAGEMENT & CONSERVATION
COURSE CODE	:	**BDE4023**
PROGRAMME	:	BACHELOR OF MECHANICAL ENGINEERING WITH HONOURS
EXAMINATION DATE	:	JUNE 2012
DURATION	:	3 HOURS

INSTRUCTIONS:

1. ANSWER ONLY **FIVE (5)** QUESTIONS FROM **SIX (6)** QUESTIONS
2. SYMBOLS HAVE COMMON DEFINITION UNLESS STATED OTHERWISE
3. STATE RELEVANT ASSUMPTIONS WHERE NECESSARY

THIS QUESTION PAPER CONTAINS SEVEN (7) PAGES

Q1 (a) Since the introduction of National Petroleum Policy in 1975, the Malaysian government has introduced National Energy Policy (1979), National Depletion Policy (1980), 4th Diversification Policy (1981) and finally **5th Fuel Policy** in 2001 in 8th Malaysian Plan. Discuss the **objective** of this policy and its implementation in Malaysia.

(10 marks)

(b) The worldwide utilization of Renewable Energy (RE) has been increasing rather slowly despite the technological sophistication achieved by mankind. What are the issues regarding generation and utilization Renewable Energy around the world?

(10 marks)

Q2 (a) Biomass from the oil palm industry has been identified as one of the most promising resource of sustainable energy in Malaysia due to its availability in very large volume. Biomass from this industry includes the empty fruit bunches (EFB), oil palm fronds, oil palm trunks, shells and fibres. Discuss the methods of utilizing these biomass.

(10 marks)

(b) Municipal solid waste (MSW) management in Malaysia lies under the authority of local government as stipulated in Section 72, Local Government Act 1976. Unfortunately, Malaysia is heavily depending on landfills for managing the MSW. State the impacts of landfilling on the environment and suggest better techniques of MSW management.

(10 marks)

Q3 (a) By giving relevant example, discuss three (3) methods of biomass conversion.

(9 marks)

(b) State three (3) important factors to be considered in choosing energy conversion technique.

(6 marks)

(c) Electric vehicles are deemed as the ultimate solution to reduce the environmental impact from transportation sector, particularly the emission. On the other hand, the batteries in these electrical vehicles are charged using electricity which is largely generated from combustion of fossil fuels. Give your comment on this issue.

(5 marks)

Q4 A single storey building with dimension presented in **Figure Q4** is used as an office area. The opaque wall is made of RC beam and brick wall whose components are given in **Table Q4(i)** and **Table Q4(ii)**, respectively. The thermal resistance R for glass window is 0.15. It is assumed that for south facing wall, the correction factor CF = 0.85. The Shading coefficient (SC) of the glass window is 0.5 (given by the manufacturer). Determine envelop thermal transfer value (ETTV) for the south facing wall. (Hint: Ignore the shading effects of the corresponding corners).

(20 marks)

Q5 **Figure Q5** shows a flat office building roof sketch with the location of 3 skylights. The opaque roof and skylight consist of several components shown in **Table Q5(i)** and **Table Q5(ii)**, respectively. The shading coefficient (SC) of the skylight is 0.5 (given by the manufacturer). Calculate:

(i) roof thermal transfer value (RTTV); and
(ii) total roof heat load.

(20 marks)

Q6 (a) State when did Malaysian government started various energy efficiency measures and give two instances of these measures.

(6 marks)

(b) Consider a wall of an air conditioned space with the information shown in Table Q6. The wall consists of three different sections. Obtain:

(i) the envelop thermal transfer value (ETTV) for the wall if the coefficient factor CF = 1.15; and
(ii) heat gain through the wall

(14 marks)

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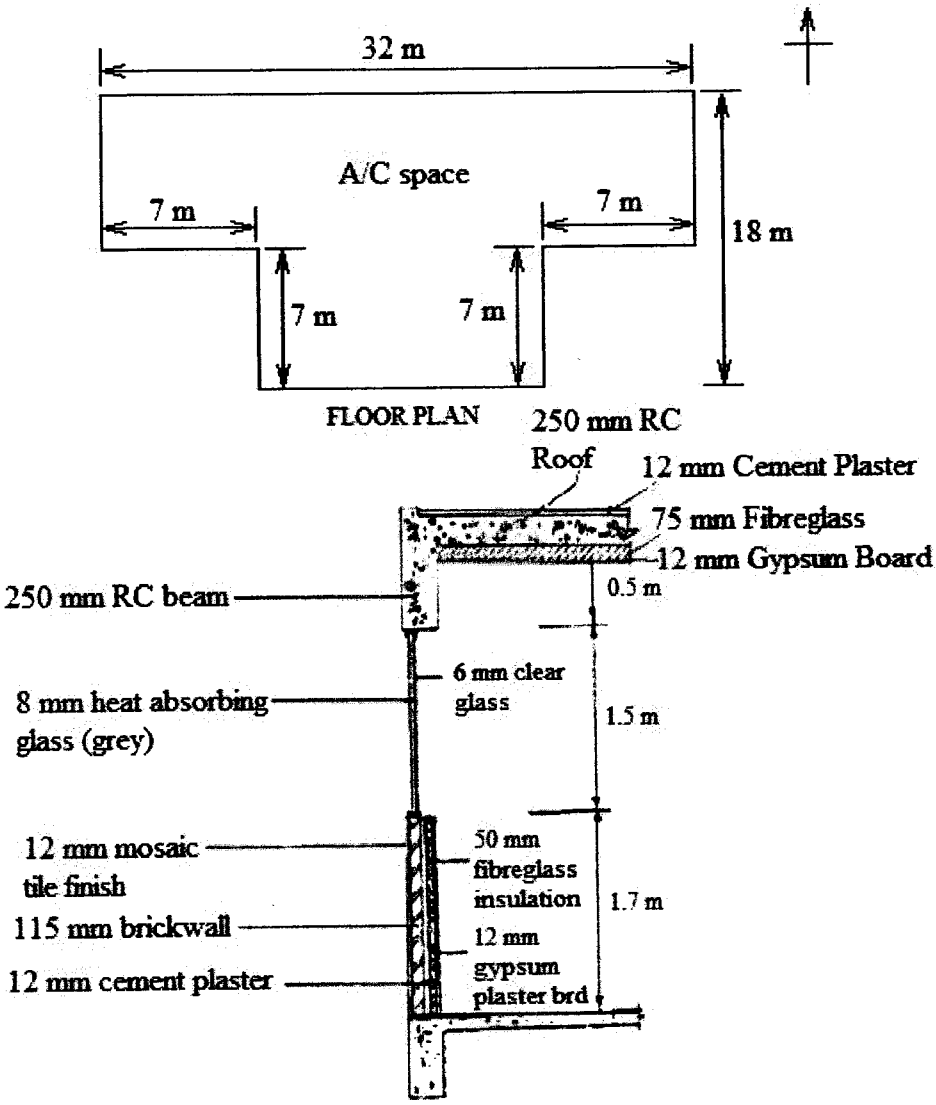

Figure Q4 Office floor plan and cross section

Component	R (m^2K/W)
Outside air film	0.044
Mosaic tile	0.009
RC	0.173
Inside air film	0.120

Table Q4(i) Components of the RC beam

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Component	R (m^2K/W)
Outside air film	0.044
Mosaic tile	0.009
Brick wall	0.143
Cement plaster	0.023
Fibreglass	1.429
Gypsum board	0.071
Inside air film	0.120

Table Q4(ii) Components of the brick wall

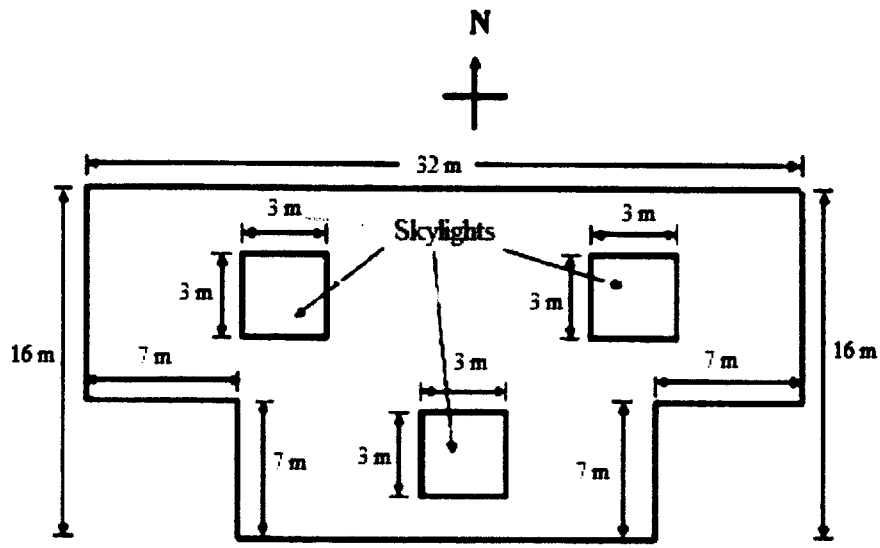

Figure Q5 Flat RC roof

Component	R (m^2K/W)
Outside air film	0.055
Cement plaster	0.023
RC Roof	0.173
Fibreglass	2.143
Gypsum board	0.071
Inside air film	0.148

Table Q5(i) Components of the opaque roof

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Component	R (m^2K/W)
Outside air film	0.055
Glass 1	0.008
Air Space	0.174
Glass 2	0.006
Inside air film	0.162

Table Q5(ii) Components of the skylight

	Area (m^2)	U (W/m^2K)	SC
Opaque Wall 1	50	0.54	-
Opaque Wall 2	45	0.75	-
Opaque Wall 3	40	0.94	-
Glass window 1	25	6.66	0.4
Glass window 2	20	7.66	0.5

Table Q6