Centre for Energy Studies

ENERGY, ECOLOGY AND ENVIRONMENT : ESL 711

Time : 2 hrs. **(Major Test : 2.12.2006)** **MM : 50**

ANSWER PART A AND PART B IN SEPARATE ANSWER SHEET

Answer to each question be at one place

PART – A : 25 Marks

1. Write notes on any four : (2x4)

   a) Gasification by koppers – Totzek method
   b) Octane and Cetane Number
   c) Aerated burner
   d) Gases manufactured to be used as fuel
   e) Turn – down ratio

2. In any four give reasons to justify the answers : (2x4)

   a) Thermal reforming takes longer time and higher temperature than thermal cracking
   b) Flash point is an important parameter for liquid fuels both in hot and cold countries.
   c) Lower and upper explosion limits have industrial application.
   d) Explaining the functioning of non-aerated burners, bring out the fact that these have both domestic and industrial use.
   e) Why is petroleum coke an important product? Give one easier method of its production.

3. a) The composition of dry flue gas from a furnace was found to have the following composition :

Co_2	10.7	Calculate the fuel composition	
O_2	5.1	by weight	(3)
N_2	84.2		

   b) Also calculate percent excess air (2)

   c) A sample of coal was heated at 110°C for one hour. On analysis, the moisture contentment was found to be 5.4%. The air dried sample was heated at 925°C for 7 minutes and volatile matter content was found to be 51%. What is the volatile matter content of the original coal? (2)

   d) A sample of coke containing 60% C and 40% ash by weight is combusted with 20% excess air by volume. Calculate the volumetric flue gas composition per 100 kg of coke. (2)

PART – B (25 MARKS)

Attempt all the questions

1. Describe the ten major engineering problems involved in using coal in thermal power stations in India. (5)

2. Calculate the theoretical amount of air required for the complete combustion of Raniganj Coal having the following analysis : C=79.5%, H = 4.5%, S=0.7%, N=1.2%, O(balance); moisture = 3.2%, ash = 31%, Volatile matter =35%. (5)

3. a) Calculate the calorific value of North Karampura coal by applying CFRI formula; the coal has the following analysis : C= 78.5%, H = 4.5 %, S=0.6%, N=1.2%, O(balance); moisture = 3.2%, ash 31%, volatile matter = 27%. If the experimental value of calorific value was found to be 5196 KCal, kg, then calculate the % error in calculating the calorific value of coal.

   b) How can we experimentally determine the calorific value of coal in the laboratory. (5+1)

4. Answer yes or no (4)

   i) Rubbles have a size range of 250-25 mm.
   ii) 1 Kg coal equivalent = 10,180 k.Cals.
   iii) India has sub-bituminous coal deposits in Hazira.
   iv) Non-coking coals have a plastic behaviour.
   v) Coal is predominantly hydro aromatic in nature.
   vi) Coal swells when it is put in quinoline.
   vii) The H/Cratio of coal is always more than 1.

5. a) Describe the process of forth flotation of coals. (3)

   b) Write short notes on the following : (2)

      i) Breeder
      ii) Chemical cleaning of coals