Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech(CT-NEW)/SEM-4/CT-401/2012

2012

ENERGY RESOURCE & ELEMENTS OF FURNACES

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : 10 × 1 = 10

   i) The fuel oils, considered as dangerous for transport and storage, have flsh point

      a) < 13°C b) < 23°C

      c) < 66°C d) < 86°C.

   ii) Reforming is a process in which the products

      a) molecular weight does not change much

      b) are of considerably low molecular weight

      c) do not contain mercaptans

      d) undergo high degree of polymerization.

   iii) Carbureted water gas has a calorific value of about

      a) 1000 kcal / Nm^3 b) 1400 kcal / Nm^3

      c) 2800 kcal / Nm^3 d) 4800 kcal / Nm^3 .

iv) Caking property is exhibited by

a) peat b) lignite

c) bituminous d) anthracite.

v) Which of the following macrocomponents is responsible for dirty and dusty character of coal ?

a) Vitrain b) Clarain

c) Durain d) Fusain.

vi) Maximum temperature of a oven should be

a) 300°C b) 350°C

c) 400°C d) 250°C.

vii) According to Pollution Control Board, minimum height of a chimney shold be

a) 300 ft b) 150 ft

c) 200 ft d) 250 ft.

viii) Induced draught is created by

a) putting fan at the front

b) putting fan at the flue path

c) draught produced by chimney

d) putting fan at flue path and at front.

ix) The function of thermocouple is

a) to record the temperature

b) to plot the temperature

c) to program the heating cycle

d) none of these.

x) The purpose of heating element is

a) to measure temperature

b) to record temperature

c) to heat the system

d) none of these.

GROUP – B
(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. How the use of LTM kiln furniture increases furnace economy ? Why does furnace efficiency decrease with increase of temperature ? $2\frac{1}{2} + 2\frac{1}{2}$

3. Explain the different types of recuperators.

4. What is weathering of coal ? What are the properties that tend to be affected by weathering of coal ? What are the preventive measures against spontaneous ignition of coal ? $1 + 1 + 3$

5. What are the disadvantages of coal tar fuel ? What do you mean by CTF 200 ? Where do you suggest the application of coal tar as fuel ? $3 + 1 + 1$

GROUP – C
(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

6. Make a comparative statement about the products of high temperature and low temperature carbonization. What is a Bee-hive coke oven ? What are the advantages and disadvantages of such an oven ? 7 + 5 + 3

7. Enumerate the principal reactions in air-blown and steam-blown producers. What are the demerits of air-blown producer and how can they be taken care of ? With the help of a diagram, indicate the different reaction zones in the fuel bed of a gas producer. What is natural gas ? How is carbureted water gas prepared ? 3 + 3 + 4 + 2 + 3

8. Define efficiency of furnace. Why is continuous furnace more efficient than a periodic one ? Explain graphically that complete combustion with minimum excess air improves fuel economy. Define energy audit and write its necessity.
2 + 3 + 6 + 4

9. Define furnace draught. Discuss the mechanism of natural draught. Deduce an equation for natural draught of a chimney.

   Calculate the draught in mm of water column produced by a chimney of 40 metre height where the temperature of the gases within the chimney is 300°C and that of outside air is 20°C. The amount of air supplied for burning of 1 kg of fuel is 18·5 kg. (1 + 2 + 8) + 4