



Name :

Roll No. :

Invigilator's Signature :

**CS/B.Tech(CT)/SEM-4/CT-403/2011
2011**

ENERGY ENGINEERING & 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.*

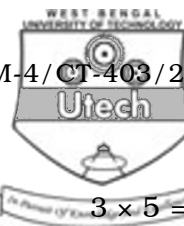
GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : $10 \times 1 = 10$
 - i) The macro component, resembling charcoal, occurring as patches of soft fibrous material, highly friable and responsible for dirty and dusty character of coal, is
 - a) vitrain
 - b) fusion
 - c) clarain
 - d) durain.
 - ii) The coal, powdery form of which is capable of producing lumpy semi coke or coke on heating, is named as
 - a) peat
 - b) lignite
 - c) bituminous
 - d) anthracite.
 - iii) In which of the following processes, petroleum fraction is upgraded without greatly disturbing the average molecular weight of parent material ?
 - a) Cracking
 - b) Reforming
 - c) Sweetening
 - d) Visbreaking.



- iv) High temperature carbonization of coal for manufacture of metallurgical coke is carried out at
 - a) 300 deg. C
 - b) 700 deg. C
 - c) 1100 deg. C
 - d) 1500 deg. C.
- v) Steaming upward and downward through the fuel bed helps maintaining a uniform bed temp. in order to produce good quality
 - a) natural gas
 - b) liquefied petroleum
 - c) blast furnace gas
 - d) water gas.
- vi) Minimum temperature of a furnace or kiln should be
 - a) 300 deg. C
 - b) 350 deg. C
 - c) 400 deg. C
 - d) 450 deg. C.
- vii) Efficiency of recuperator is more for
 - a) cross flow type
 - b) parallel flow type
 - c) counter flow type
 - d) vertical flow type.
- viii) Sp. fuel consumption means
 - a) heat utilized by the product/total tonnage
 - b) fuel utilized by the product/total tonnage
 - c) total heat input/total tonnage
 - d) fuel input/total tonnage.
- ix) LTM kiln furniture means
 - a) low thermal mass type
 - b) low temperature modular type
 - c) low temperature muffle type
 - d) all of these.
- x) For stoichiometric combustion of 1 kg of fuel, amount of air required is
 - a) 12.1 kg
 - b) 13.1 kg
 - c) 14.1 kg
 - d) 15.1 kg.



GROUP – B
(**Short Answer Type Questions**)

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

2. Write a note on energy audit and its management.
3. Complete combustion with minimum excess air improves fuel economy of a furnace. Discuss.
4. What is weathering of coal ? What are the properties that get affected due to this ? What are the measures for preventing weathering or spontaneous combustion of coal ? $1 + 2 + 2$
5. Describe the basic principles of water gas generation. What is carbureted gas ? $3 + 2$

GROUP – C
(**Long Answer Type Questions**)

Answer any *three* of the following. $3 \times 15 = 45$

6. Describe how crude petroleum is distilled to obtain useful products with the help of a flow sheet. What do you mean by Octane no. and Cetane no. ? How is the performance of petrol and diesel engine related to the hydrocarbon structure of the fuel ? What is the significance of determination of flash point and fire point of a fuel oil ? $6 + 4 + 2 + 3$
7. What is the reason behind spontaneous ignition of coal ? Suggest some measures for prevention of weathering or spontaneous ignition of freshly mined coal. Describe the effect of heat on coal when it is heated in a furnace in absence of air, the temperature being gradually increased.

What is the difference between gross calorific value and net calorific value ? Define inflammability limits. Indian coal tend to show comparatively high ash content. Why ?

$3 + 2 + 4 + 2 + 2 + 2$



8. Show graphically how efficiency of a furnace varies with the temperature. Why does it vary like this ? In what way optimum capacity utilization reduces firing cost ? What is the role of a burner for liquid / gaseous fuel ? explain classification of recuperators. Why is actual draught always less than the theoretical one ? $2 + 2 + 3 + 1 + 5 + 2$

9. Classify draught. Discuss the mechanism of natural draught. What are the advantages of metallic heat exchangers over ceramic one ?

Calculate the draught in mm of water column produced by a chimney of 32 meters height when temperature of gases within the chimney is 300 deg. C and temperature of outside air is 20 deg. C. The quantity of air supplied per kg of fuel is 18 kg. If the actual draught is 80% of the theoretical draught, calculate the actual draught.

$3 + 3 + 3 + 6$
