

II B.Tech. II Semester Regular Examinations, April/May -2005
FUELS FURNACES AND REFRACTORIES
(Metallurgy & Material Technology)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Explain the Insitu theory of origin and formation of coals.
(b) Give the calorific value of various types of coals and indicate their respective uses.
2. Write the manufacture, properties and uses of
 - (a) Producer gas
 - (b) Water gas.
3. (a) Explain the concept of Black body.
(b) Discuss about emissivity of materials.
4. (a) Explain the term emissivity and black body with reference to radiation heat transfer.
(b) Two parallel, opposed, infinite black plates are maintained at $300^{\circ}C$ and $400^{\circ}C$ respectively. If the temperature difference is doubled by increasing the temperature from $400^{\circ}C$ to $500^{\circ}C$, by what factor is the net heat exchange increased ($\sigma = 4.87 \times 10^{-8} Kcal/m^2 - hr - k^4$)
5. (a) Describe the characteristic features of open hearth furnace with a neat diagram.
(b) Explain how an electric resistance tubular furnace works.
6. (a) Explain peltier and Thomson effects.
(b) Give the composition and uses of various thermocouple materials
(c) What is a thermopile.
7. (a) Explain the Principle and working of a total radiation pyrometer.
(b) What are the disadvantages of radiation pyrometers over thermo electric pyrometers.
8. Explain the following:
 - (a) Spalling resistance of refractories.
 - (b) Classification of refractories.
 - (c) Refractoriness under load.

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1. (a) How do you classify fuels?
(b) What is meant by pulverized fuel? What are the advantages and disadvantages of using pulverized fuels in furnaces?
2. (a) What is Blast furnace gas? What is its composition and uses.
(b) What is composition, properties and uses of coke oven gas.
3. (a) Explain conduction, Convection and radiation with suitable examples
(b) Explain what you mean by steady state and unsteady state conduction.
4. Explain the following:
 - (a) Reynolds Number
 - (b) Nusselts Number
 - (c) Log mean temperature difference.
5. (a) Discuss the importance of waste heat recovery in Metallurgical furnaces.
(b) Explain in detail the characteristic features of Arc furnaces.
6. (a) What is a thermopile? How this can be utilized in measuring temperature?
(b) Discuss various methods of cold junction correction in case of thermo electric pyrometers.
7. (a) Distinguish between a disappearing filament optical pyrometer and a radiation pyrometer.
(b) Discuss the various factors which affect the reading of an optical pyrometer.
8. (a) Explain what are the important properties that are required for a refractory material.
(b) Explain how refractoriness under load is determined.

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1. (a) What do you mean by the term carburization?
(b) What are the changes that take place during carburization? Describe Box test of carburization.
2. (a) With the aid of a neat sketch explain the fractional distillation of crude oil.
(b) Explain what you mean by catalytic cracking.
3. What is Stefan Boltzman law? How is it used for heat transfer by radiation?
4. Explain the following:
 - (a) Reynolds Number
 - (b) Nusselts Number
 - (c) Log mean temperature difference.
5. (a) Discuss the factors affecting fuel economy in a furnace.
(b) Compare and contrast batch type and continuous furnaces citing examples of processes.
6. (a) What is see beck effect?
(b) What are the properties that are required in a thermocouple? Explain.
7. (a) Explain in detail the principle, Construction and working of a resistance thermo meter.
(b) Name some applications of resistance pyrometer.
8. With the aid of a line diagram explain the manufacture of fire caly refractories. What are the advantages of these refractories over other refractories?

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1. (a) How do you classify fuels?
(b) What is meant by pulverized fuel? What are the advantages and disadvantages of using pulverized fuels in furnaces?
2. (a) What are the other names of water gas?
(b) Describe a method for the manufacture of water gas.
(c) What is carbureted gas? Where do they use this?
3. (a) Derive the relation for heat transfer by conduction under steady state for a plane wall when there is a sudden change of surface temperature.
(b) Derive a relation for unsteady state heat conduction through a sphere assuming there is no variation of temperature with angular position.
4. (a) Derive Newton-Rikman law for a fluid in contact with a solid boundary.
(b) Describe various types of heat exchangers based on temperature distribution.
5. (a) Describe the characteristic features of open hearth furnace with a neat diagram.
(b) Explain how an electric resistance tubular furnace works.
6. (a) What is a thermopile? How this can be utilized in measuring temperature?
(b) Discuss various methods of cold junction correction in case of thermoelectric pyrometers.
7. (a) Explain Planck's distributive law.
(b) Explain the Principle and operation of an optical pyrometer. What are its uses.
8. (a) Explain what are the important properties that are required for a refractory material.
(b) Explain how refractoriness under load is determined.
