Code No: R09221803 | R09 | SET-1

B.Tech II Year - II Semester Examinations, April-May, 2012
FUELS FURNACES AND REFRACTORIES
(Matallugry and Material Technology)

Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks

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1. What type of fuels available in the earth's crust? Discuss about their origin. [15]

2. How coke is different from coal? Explain the role of coal and coke in the manufacture of iron and steel. [15]

3.a) Differentiate between coke oven gas and blast furnace gas.
b) Explain the properties and applications of water gas. [7+8]

4.a) Define thermal conductivity. Explain the units for thermal conductivity.
b) Derive an equation for rate of heat transfer through a composite wall built of three walls of different materials under steady state unidirectional conduction. [5+10]

5.a) Discuss the characteristic features of cupola furnace with the help of a neat sketch.
b) Explain the sources of heat losses in furnaces in detail. [8+7]

6. Explain the principle, operation and working of thermoelectric pyrometer with a neat sketch. [15]

7.a) What is the composition of chrome-magnesite refractories? Explain its important applications.
b) How the quality of these refractories is assessed? [9+6]

8. Explain the selection of refractory materials for the following with reasoning.
a) Hearth region of the blast furnace
b) Muffle furnaces
c) Soaking pits. [5+5+5]

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Code No: R09221803 | R09 | SET-2

B.Tech II Year - II Semester Examinations, April-May, 2012
FUELS FURNACES AND REFRACTORIES
(Matallugry and Material Technology)

Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks

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1. What is Proximate analysis of coal? Explain how it is carried out. [15]

2.a) What is pulverization? How it is different from carburization?
b) How coke is manufactured? Explain. [8+7]

3. What are the different types of fuel oils? Explain the principles involved in the production of fuel oils. [15]

4.a) What is Fourier's law of heat conduction? Derive an expression for heat flux where the heat flow occurs through a heterogeneous isotropic plate.
b) Determine the steady state rate of heat transfer per unit area through a 4.0 cm thick homogeneous slab with its two faces maintained at uniform temperatures of 38^0C and 21^0C. The thermal conductivity of the material is 0.19 W/m ^{0}K. [8+7]

5.a) Explain the importance of shape factor in furnaces.
b) Discuss the thermal efficiency of a furnace. [7+8]

6. Write short notes on the following:
a) Thermocouple
b) Millivoltmeter.
c) Potentiometers [5+5+5]

7. What are the methods available for the manufacture of magnesite refractories from Dolamite and Magnesite? Explain in detail any one method. [15]

8. Explain the criteria for the selection of different types of refractories in different levels of the blast furnace. Also mention the type of refractories used. [15]

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Code No: R09221803 | R09 | SET-3

B.Tech II Year - II Semester Examinations, April-May, 2012
FUELS FURNACES AND REFRACTORIES
(Matallugry and Material Technology)

Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks

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1.a) What is dry quenching of coke? Explain its advantages and disadvantages.
b) Explain the important properties of coke. [8+7]

2. What are the different types of fuels? Discuss their classification with examples and differentiate between them. [15]

3.a) Compare and contrast the water gas and producer gas.
b) Explain the cleaning of blast furnace gas. [7+8]

4.a) Define the initial and boundary conditions encountered in heat conduction problems.
b) A plane wall of 50 cm thickness is constructed from a material of thermal conductivity bearing a relation with temperature is $k = 1 + 0.0015T$, where T is in ^0C and k in W/m ^0K. Calculate the rate of heat transfer through this wall per unit area if one side of the wall is maintained at 1000^0C and the outer at 0^0C. Assume steady state conditions. [8+7]

5. Describe in detail about the characteristic features of continuous furnaces and of Induction furnace. Identify some uses for which these furnaces are better suited than other type of furnaces. [15]

6.a) Describe the resistance measurement by Wheat Stone Bridge.
b) Give the applications of resistance thermometer. [8+7]

7.a) What is refractory material? Give the classification of refractories based on composition and chemical activity.
b) Explain pyrometric cone equivalent test. [8+7]

8.a) Explain the utility of fire clay refractories in various metallurgical fields.
b) List out the tests which are used for testing refractories. [8+7]

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Code No: R09221803 | R09 | SET-4

B.Tech II Year - II Semester Examinations, April-May, 2012
FUELS FURNACES AND REFRACTORIES
(Matallugry and Material Technology)

Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks

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1.a) How the properties of coke are determined? Explain.
b) What is Carbonization and differentiate between Low temperature Carbonization and High temperature Carbonization. [8+7]

2.a) How the classification of coal is done? Explain any one method of coal analysis.
b) Differentiate between proximate analysis and ultimate analysis. [8+7]

3.a) What is producer gas? Explain its manufacture and properties.
b) Differentiate between produce gas and watergas. [8+7]

4.a) Derive an expression for rate of heat transfer through the thick walled hollow cylinder under steady state conditions.
b) What is the critical thickness of pipe insulation under steady state conditions? Comment on the result. [8+7]

5. Derive an expression that describes heat balance during the operation of a Tube resistance furnace. Clearly indicate all the operating conditions that you are assuming. [15]

6.a) What characteristics must materials possess to make them ideal for use in a thermocouple?
b) What are the base metal thermocouples and write some of their advantages and disadvantages? [7+8]

7.a) List out the important properties of silica-magnesite bricks. Explain its advantages over fire clay bricks.
b) What is the importance of RUL test? [8+7]

8. What are the tests that are performed on refractories to ascertain its quality? Explain any three tests. [15]

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