

21/11/13

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**B.E / B.Tech ( Full Time ) DEGREE END SEMESTER EXAMINATIONS, NOV / DEC 2013**

**MATERIAL SCIENCE AND ENGINEERING**

Sixth Semester

9

**ML 9029 FUELS FURNACES & REFRACTORIES**

(Regulation 2008)

Time: 3 Hours

Answer ALL Questions

Max. Marks 100

**PART-A (10 x 2 = 20 Marks)**

1. Define Peltier effect.
2. What is radiation mode of heat transfer?
3. List a few renewable energy sources.
4. List out at least **four** fuels used in nuclear reactors.
5. What is the principle of working of a reverberatory furnace?
6. Expand – PID.
7. List two heat resistant materials.
8. Name any two refractories used in chemical industry.
9. What are the emissions coming out a typical foundry?
10. Why waste heat recovery is necessary?

**Part – B ( 5 x 16 = 80 marks)**

11. i) What are refractories? Describe the various refractories used in extractive metallurgy of ferrous and non-ferrous materials. (12)  
ii) Briefly discuss the applications of heat resistant materials in energy conversion and petroleum industries. (4)
12. a)i) Explain the conduction, convection and radiation modes of heat transfer with examples. (3x3=9)  
ii) How we are able to measure temperature with the help of a thermocouple? (6)

(OR)

- b)i) Consider a solid cylindrical rod of length 0.5 m and diameter 0.03 m. The top and bottom surfaces of the rod are maintained at constant temperatures of 20°C and 85°C, respectively, while the side surface is perfectly insulated. Determine the rate of heat transfer through the rod if it is made of (a) Copper,  $k = 380 \text{ W/m} \cdot ^\circ\text{C}$ , (b) Steel,  $k = 18 \text{ W/m}^\circ\text{C}$ , and (c) Granite,  $k = 1.2 \text{ W/m}^\circ\text{C}$ . Repeat the above when the internal & external surface resistance values are 25 & 40  $\text{W/m}^2\text{K}$  respectively. (12)  
ii) What are the constraints for complete conversion of thermal energy into work? (4)

14b

Define the term Machinability. Explain how it is influenced by the following  
(i) Work material microstructure (ii) Type of cut  
(iii) Tool rake angle

16

15a

Sketch and describe the hydraulic circuit for a shaper. What are the advantages and disadvantages of hydraulically actuated machine tools?  
(OR)

16

15b

Explain the principle of Gear hobbing operation. What are the advantages of gear hobbing?

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