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National Institute of Technology Hamirpur

B.Tech –Semester VII

End Semester Examination

MS-432: Fuels, Refractory, and Furnaces

Duration: 180 Minutes

Max. Marks: 50

Note: This question paper consists of 1 page and 7 questions. It is mandatory to attempt all the questions. The diagrams or flow charts drawn should be neat and properly labelled.

- Briefly explain the following terms with suitable examples (wherever required):
 - Knocking
 - Calorific value
 - Salt bath furnace
 - Sankey diagrams
 - Turndown ratio

(3*5=15 marks)
- State the difference between the following:
 - Octane number and Cetane number
 - Acid, Basic, and Neutral refractories
 - Pusher type furnace and Walking beam furnace
 - Parallel Flow Recuperators and Counter Flow Recuperators

(3*4=12 marks)
- Briefly explain the key functions of the following components of a typical furnace:
 - Damper
 - Burner
 - Control valve
 - Hearth
 - Economizers

(5 marks)
- What is a 'Bomb Calorimeter'? How it is used to determine the calorific value of the fuel?

(1+2=3 marks)
- With a neat diagram, explain the instrumentation, key electrical requirements, and working mechanism of a typical 'Direct-arc melting furnace'.

(1+1+1+2=5 marks)
- Differentiate between 'Recuperators' and 'Regenerators' used in furnaces. Highlight their key advantages and disadvantages.

(2+2= 4 marks)
- What are the key factors to consider while selecting appropriate refractory materials for a furnace design? What refractory testing protocol should be followed by a furnace designer to achieve long service lives?

(2+4=6 marks)