7. a) Describe the production process of the following materials giving the details of raw materials, chemical reaction & other relevant matter in production for each item.

   i) Silicon Metal 5

   ii) Ferro Tungsten 4

   iii) Ferro Vanadium 6

Ex/MET/T/424/111/2010

BACHELOR OF METALLURGICAL ENGG. EXAMINATION, 2010

(4th Year, 2nd Semester)

PRODUCTION OF FERRO ALLOYS

Time : Three hours. Full Marks : 100

Answer Question **no.1 & 2** and any three from the rest

1. a) During the production of silico calcium how the melter controls the formation of detremental fusible slag? Discuss. 4

   b) Discuss the different characteristics of carbothermic & silicothermic reduction processes to produce ferro alloys. 3+2

   c) State the role of lime in ferrovanadium & ferrotitanium production. 5

   d) State the salient features of ferro niobium smelting using the niobium oxide, generated as a by product from niobite-tantalite ore to produce tantalum metal. Name another ore of niobium. 4+1

   e) Discuss about the mode of addition of ferro alloys & different parameters on which the mode of addition is dependant on. 5

   f) For the production process of low carbon silico manganese (LCSM) one company has installed four submerged EAF (12 MVA each). The total operating cost of the plants per year is 260 crores out of which 10% is total cost without cost of raw materials & power. The ratio of power cost & cost of raw materials is 2.5.

      The electrical energy consumption for the plant is 6,200 kwh/ton of LCSM.

The charge of electrical energy is Rs. 4/kwh.

The line & distribution loss is 5%.

Find out the fixed demand charges for electricity per year.

Given :

The load factor & the power factor for the furnace are 0.91 & 0.86.

The operating days per year is 330 for furnace. 8

g) State different uses of manganese. What is the advantages of using manganese over other additives in steel melt? 2+1

2. a) What is charge chrome? Give its specification. 5

b) How are chromites agglomeration different from iron ore agglomeration? Discuss. 5

c) Draw Fe-Cr equilibrium diagram and discuss the region of Fe-Cr interest during production. 5

d) Discuss about the slag phase composition of ferro-chroms smelting. 5

3. a) Discuss about the Fe-Mn solution behaviour with the help of equilibrium diagram. 5

b) Which phase is more stable Mn_3C or Mn formation at lower temperature in presence of 'C'? Explain. 5

c) How will you control 'P' level during Fe-Mn smelting? Discuss. 5

Or

What is Soderberg electronics? Illustrate with an example. State the benefits of Soderberg electrodes.

4. a) What are the requirements of reducer for Fe-Si production? Discuss. 5

Or

How SiC formation is avoided? Explain.

b) Draw a neat sketch of DC electric arc furnace. State the advantages of it. 5

Or

Give a typical composition of Ferro Nickel with its nature of product. 5

c) Write short notes of any one of the followings : 5

i) Ferro Boron

ii) Ferro Zirconium

5. a) Define ferroalloy & state the classification of ferro alloys. 1+2

b) State the present problems & their remedies in Indian ferroalloy industry. 4+2

c) Describe the production process of silico chrome. 5

d) Name one ferro alloy producing company in India. 1

6. a) Describe the influence of slag composition, thermal effect & powder particle size in aluminothermic reduction to produce ferro alloys. 8

b) How Molybdenum ingot is manufactured in industry? 5

c) What is the effect of using Illmenite & Rutile as starting raw material to produce ferro titanium, on finished product quality? 2