5.3 TUTORIAL SHEET:3:PROBLEM:1

PROBLEM:1

- (1) A gear blank casting in the shape of a ring having an internal diameter 200 mm and an outer diameter of 300 mm is to be cast in plain carbon steel. The height of the casting is 100 mm. The shrinkage of the alloy is 5%. 1000 pieces of this casting are to be made in one year. Suggest a suitable moulding method and recommend suitable gating and feeding techniques. Calculate the feeder dimensions and the number of feeders needed to produce a sound casting.

5.3 TUTORIAL SHEET:3:PROBLEM:1

MOULDING METHOD:

The casting is about 1000 kgs and the number needed is NOT large. Hence gravity die casting, pressure die casting and the investment casting and centrifugal processes are eliminated.

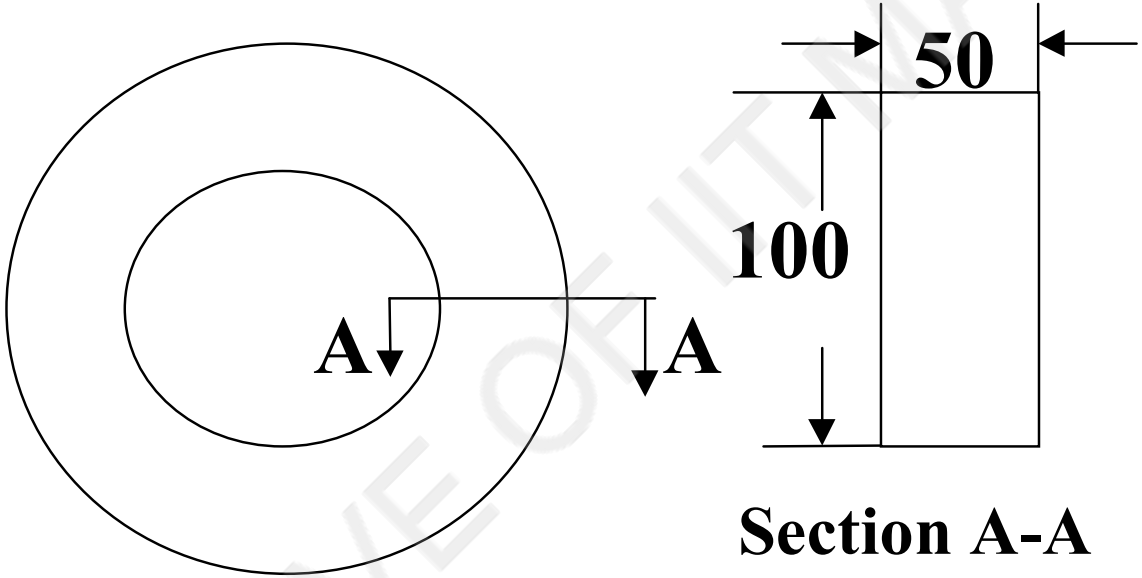
As the gear is subsequently to be machined, very high dimensional accuracy is not needed.

The size of the casting is quite large.

So air setting sands may not be used as the cost of production will be very high.

The best method will be dry sand mould process or CO_2 moulding process with wooden patterns.

5.3 TUTORIAL SHEET:3:PROBLEM:1



5.3 TUTORIAL SHEET:3:PROBLEM:1

Modulus of the Casting = Mc
= Area / Perimeter
= 5000/300 16.66 mm
Modulus of the Feeder = 1.2 * Mc
= 1.2 * 16.66 = 20 mm
Diameter of the Feeder = 6 * M_F
= 6*20 = 120 mm
Height of the Feeder = 120 mm

NUMBER OF FEEDERS NEEDED: N_F :
Feeding range = 2 T + 2 T = 4 T
= 4 * 50 = 200 mm

FEEDER DESIGN:

Average diameter = 250 mm
Average Circumference = 3.14 X 250 = 785
Calculations for ONE Feeder dimension:

Modulus = Area/perimeter

FD > AL
AL= 3.14 X 250

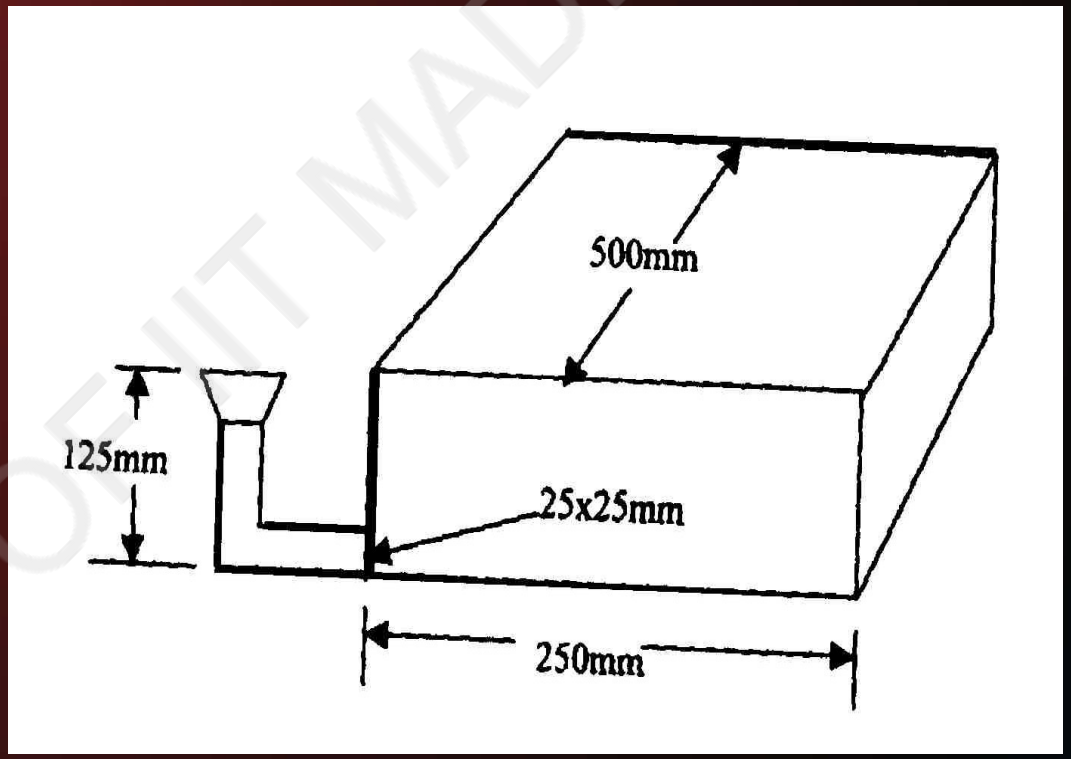
AL = 785 mm

Feeding distance = FD :

NF * 200 + N_F *120
AD < FD
(N_F * 200) + (N_F * 120) > 785
The number of feeders needed are =N_F = 3

5.3 TUTORIAL SHEET:3:PROBLEM:2

(2) Calculate the pouring time of a 125 x 250 x 500 mm plate casting using a 25 x 25 mm ingate and a constant head of 125 mm for the bottom pouring shown in Fig. (Neglect orifice and frictional effects). Compare this pouring time with that of the entire sprue in Fig. Being moved to a top gating position with the spnie height maintained at 125 mm. (g = 981 cm sec^{-2})

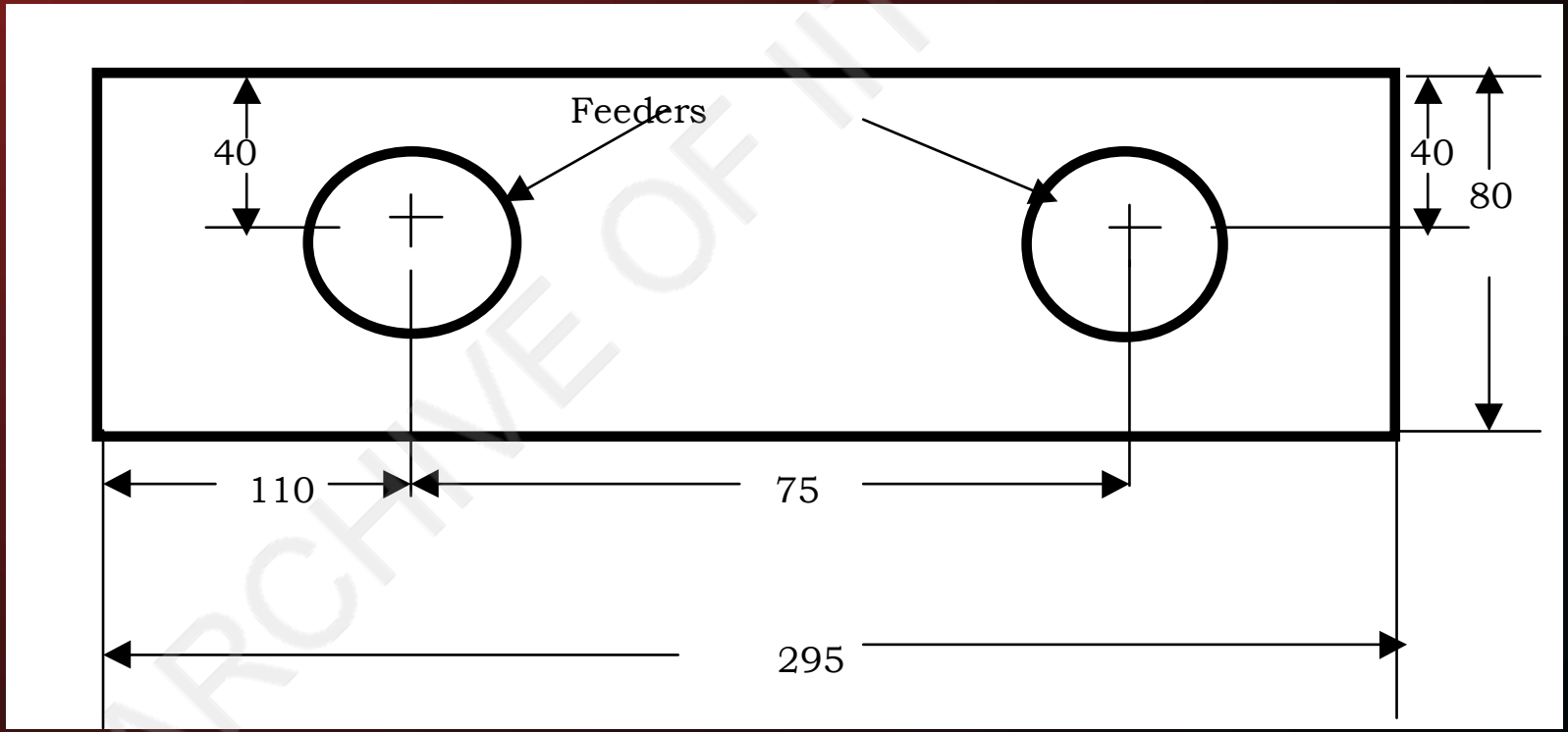


5.3 TUTORIAL SHEET:3:PROBLEM:2

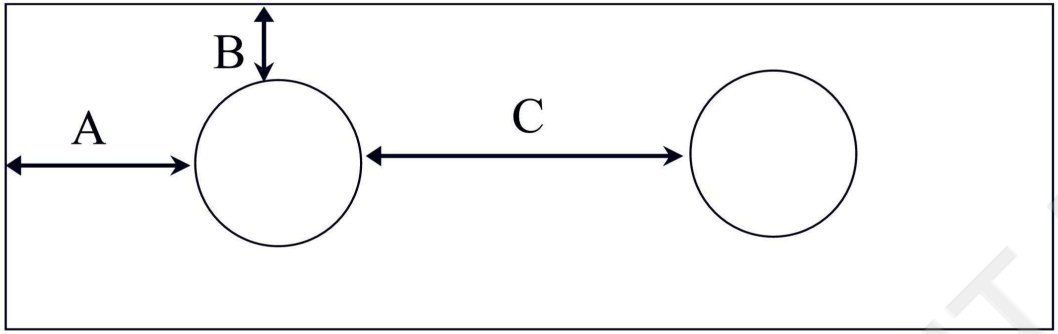
SOLVED AS AN EXAMPLE IN THE LECURE ITSELF.

5.3 TUTORIAL SHEET:3:PROBLEM:3

(3)Show the location and the extent of the shrinkage defect in the casting. The diameter of the feeders is 20 cm.
Thickness of the plate = 20 cm
All dimensions are in centimetres.



5.3 TUTORIAL SHEET:3:PROBLEM:3



Three zones will pose problem for feeding.

A,B and C.

Zone A:

Actual Length of the casting =AL= 110-10=100 cm

Feeding Distance =FD= 2 T + 2.5 T = 4.5 X T = 4.5 X 20 = 90 cm.

AL> FD, So there will be a shrinkage defect that is (100-90) 10 cm long.

Zone B:

AL= 40-10 = 30 cm

FD = 2 T + 2.5 T = 4.5 T = 4.5 X 20 = 90 cm.

AL<FD , so no shrinkage.

Zone C

AL=75-20 = 55 cm

FD = 2T + 2T = 4 x T = 4 X 20 = 80 cm.

AL < FD , so no shrinkage.