

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)**

**CLASS: IMSC
BRANCH: FT**

**SEMESTER : IX
SESSION : MO/19**

SUBJECT: SAF3013 GRAIN STORAGE TECHNOLOGY

TIME: 3 HOURS

FULL MARKS: 60

INSTRUCTIONS:

1. The question paper contains 7 questions each of 12 marks and total 84 marks.
 2. Candidates may attempt any 5 questions maximum of 60 marks.
 3. The missing data, if any, may be assumed suitably.
 4. Before attempting the question paper, be sure that you have got the correct question paper.
 5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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- Q.1(a) Explain following terms in details: bulk density, true density, Porosity, angle of repose, thermal conductivity and thermal diffusivity. A 65gm piece of iron at 525°C is put in to 635gm of water at 15°C. calculate final temperature of water & the iron? [6]
- Q.1(b) Explain wet bulb temperature with diagram, drag coefficient, aerodynamic properties of grains and in mixture of dry air and water vapor at a total pressure of 745mm of Hg, the partial pressure of water vapor is 25mm of Hg. The specific humidity of air in gram of water vapor per kg of dry air (gram water/kg of dry air) is? [6]
- Q.2(a) Explain drying, workin process of batch dryer and types of moisture content with the help of diagram. [6]
- Q.2(b) Explain the workin process of continuous dryer and Slab of paper pulp 1m x 1m x 0.015m is to be dried under contant drying conditions from 66% to 29.30% moisture. The value of equilibrium moisture for the material is 0.5%. if the critical moisture content is 60% & the rate of drying of critical point is 1.5kg/m².sec; calculate the drying time. The dry weight of each slab is 2.5 kg. Assume all moisture contents are on wet basis. [6]
- Q.3(a) Explain the aeration grain storage technology in details and also underground pits. [6]
- Q.3(b) Explain grain storage and its conditions. Determine the dimensions of rectangular warehouse to store 1000 tonns of maize in bags in four separate lots. The length should be approximately twice the width. The specific volume of maize is 1.8 cubic meter per ton. Each lot should be measure 6mx15m. [6]
- Q.4(a) Name different types of software for the modeling exercise of complex storage systems. [2]
- Q.4(b) Describe structural configuration of bricked-wall silo with diagram. [4]
- Q.4(c) Design a rectangular warehouse to store 1000 ton of wheat grain in bags in 6 separate lots. The specific volume of wheat is 1.60 m³/ton. Each lot should measure 4 m × 10 m. Assume a suitable stack height. Determine the followings: i) dimensions of the warehouse stacking with a diagram, and ii) percentage utilization. [6]
- Q.5(a) Name different types of detection and monitoring methods for insect. Mention their major characteristics. [2]
- Q.5(b) Compare elaborately the feasibility of steel and concrete as the material of construction of a storage silo. [4]
- Q.5(c) A reinforced cement concrete bin of cylindrical shape with conical roof is employed to store 40 ton of paddy grain of bulk density 600 kg/m³. The angle of internal friction of paddy grain is 35°. The angle of friction between the grain and bin wall is 30°. Assume a suitable internal diameter of the bin. Evaluate the followings for the bin: i) total height, ii) vertical and horizontal pressures, iii) total load on the bin in N assuming 3 points along the length of the bin. [6]
- Q.6(a) Name few mycotoxins with their source in a grain storage. [2]
- Q.6(b) Briefly explain the effect of temperature on insect in grain storage. [4]
- Q.6(c) Discuss different types of fumigants and their application methodology for pest control in grain storage. [6]
- Q.7(a) What is funnel flow bin? [2]
- Q.7(b) Depict oxygen level (concentration %) to kill different species of insect in controlled atmosphere with tabular form. [4]
- Q.7(c) Explain controlled atmosphere in a grain storage with schematic diagram. [6]