

BE Mechanical Engineering 4<sup>TH</sup> Year, 2<sup>ND</sup> Semester Examination- 2022

SUBJECT: Mechanical Handling of Materials

Time: 4 hours

Full Marks: 70

Assume any data only if needed

**GROUP A**

1. Write short note on any **two** of the following: 5x2 =10

- (a) Pneumatic conveyor
- (b) Unpowered roller conveyor
- (c) Vibrating conveyor
- (d) Advantages and limitations of apron conveyor
- (e) Application of Skip hoist with example

**GROUP B**

Answer any three questions

2. (a) What are the basic objectives of Material handling system?  
(b) What is the difference between unit load and bulk load? What is static and dynamic angle of repose?  
(c) State advantages and disadvantages associated with Unitization of load. [4+(4+4) + 8]
3. (a) Draw neatly the feeding and discharging arrangement of a centrifugal discharge type of bucket elevator. Label the diagram.  
(b) A bucket elevator is to be designed to handle aluminium ore of 100 tons per hour. The height of elevator is 20m. Calculate the individual capacity of bucket in liters on the basis of the following data:  
i) Bucket filling factor =0.75  
ii) Material bulk density =1300 kgf/m<sup>3</sup>.  
iii) Elevator speed =0.83 m/sec  
iv) Bucket spacing =0.320m [10 + 10]
4. (a) Find out the width of the belt of a horizontal 3- roller troughed belt conveyor designed to convey 150 ton/hr of foundry sand for sand plant at a speed of 2.5 m/sec. The side idlers are set at angles of 20°. Given that:  
(i) Bulk weight of material is 0.8 tons/m<sup>3</sup>.  
(ii) Static angle of repose of the load is 45°.  
Deduce the expression that you use in solving the problem with necessary assumptions

[ Turn over

(b) In a neat sketch, show the general arrangement of a belt conveyor system and label the different important parts. [10+10]

5. (a) A Screw conveyor is to be designed to convey moulding sand at an inclination of  $15^\circ$  with the horizontal. The required capacity is 50 tons per hour, length of conveying is 25 meter, bulk density of sand 1.50 ton/cubic meter and is abrasive in nature, loading efficiency is 0.125, screw pitch =  $1.0D$  (where  $D$  = nominal diameter of screw), r.p.m of the screw is 50 r.p.m, inclination factor is 0.7, mass flow rate is 50 ton/hr, progress resistance coefficient is 4. Find out
- (i) Nominal diameter of screw in meter. (ii) Total power of screw required in Kw.

(b) Write down any ten principle of Material Handling System? Discuss in detail

[10+10]

6. (a) What are the advantages and limitation of E.O.T crane?

(b) Why and when troughing of a belt in a belt conveyor is necessary? Show any one methods of troughing.

(c) Boxes of size 220mm x 180mm x 100 mm have to be conveyed by a belt conveyor of sufficient belt strength, at the rate of 2000 boxes per hour. What is the belt size and speed of the conveyor? Place the boxes with a gap of 200 mm between boxes and calculate the side clearance.

[4+ 6+ 10]