Ref: Ex/ME/5/T/521/2023

BACHELOR OF ENGINEERING (MECHANICAL ENGINEERING) FIFTH YEAR SECOND SEMESTER - 2023

SUBJECT: MATERIAL HANDLING

Time: 3hours **Full Marks: 100**

Answer any five questions
Assume any data only if needed

Q1. (a) How bulk load and unit load are characterized? What is static and dynamic angle of repose? Why dynamic angle of repose is considered.

(b) Explain the typical applications of screw conveyor. Sketch different profiles used in screw conveyor. State the restrictions in screw conveyor system.

[10 +10]

Q2. (b) In a neat sketch, show the general arrangement of a belt conveyor system and label the different important parts.

(c) Why and when troughing of the belt in a belt conveyor system is necessary? Show any one method of troughing. [15+5]

Q3. (a) How a material is coded? Give any one example with code.

(b) What are basic objectives of Material Handling System? Discuss in detail.

[10+10]

Q4. (a) A Screw conveyor is to be designed to convey moulding sand at an inclination of 15^0 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 five principle of Material Handling System? Discuss in detail

[12+8]

Q5. (a) A horizontal belt conveyor with 3-roller troughing arrangement handles coal at the rate of 150 ton/hr at a speed of 2.5 m/sec. the side troughing idlers are set at an angle of 15^0 with respect to the axis of central idler. If the bulk weight of the material is 0.8 ton/m^3 and static angle of repose of the load is 45^0, then find out the width of the belt. Deduce the expression that you use in solving the problem with necessary assumptions .

(b) What is necessity of take –up arrangement in a belt conveyor system? Draw the vertical take up unit used in belt conveyor.

[15+5]

[Turn over

Q6. (a) Draw neatly the feeding and discharging arrangement of a continuous 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^3.
iii) Elevator speed =0.83 m/sec
iv) Bucket spacing =0.320m

[5+15]

Q7. (a) Explain total resistance to motion take place in case of unpowered roller conveyor.

(b) What is throw factor in vibratory conveyor and what are its significance?

[15+5]

Q8. (a) Show with neat sketches, different types of buckets used on the bucket elevators. How the buckets are designated?

(b) 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.

[14+6]