Ref. No. Ex/ME/5/T/521/2024

B.E. MECHANICAL ENGINEERING FIFTH YEAR SECOND EMESTER EXAM-2024

SUBJECT: MATERIAL HANDLING

Time: 3 Hours | Full Marks: 100

Assume any relevant data, if necessary. Symbols in the Question Paper carry their usual meanings. All Parts of any one question must be answered together.

Answer any FIVE Questions

Q1. (a) What are the basic objectives of materials handling systems?
(b) Discuss advantages and disadvantages of unitization of load.
(c) Write down any five principles of Material Handling System. Discuss in detail.
(d) What is Static and dynamic angle of repose? Why dynamic angle of repose is necessary?
[4+4+6+6]=20

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

(b) Find out the width of the belt of a horizontal 3- roller troughed belt conveyor designed to convey 150 Tonnes/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 the following data:
(i) Bulk weight of material is 0.8 tons/m^3.
(ii) Static angle of repose of the load is 45°.
[10+10]

Q3 (a) What is the necessities of a take up arrangement in belt conveyor? State different types of take up arrangement in belt conveyor system.
(b) Why and when troughing of a belt in a belt conveyor is necessary? Show any one methods of troughing.
[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 tones per hour, length of conveying is 25 mtr, bulk density of sand 1.50 ton/cubic mtr 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 0.55, mass flow rate is 60 tones/hr, progress resistance coefficient is 4. Find out
(i) nominal diameter of screw in meter.
(ii) total power of screw required in Kw.

(b) What types of materials are suitable and unsuitable for screw conveyor?
[14+6]

Q5. (a) Explain total resistance to motion take place in case of unpowered roller conveyor.

(b) Explain typical application of screw conveyor in details. Draw a neat sketch of a screw conveyor system.

[10+10]

[Turn over

Q6. (a) Explain with neat sketches, any two types of buckets used in bucket elevators and state their uses.
(b) A bucket elevator is to be designed to handle aluminium ore of 100 tons per hour. The height of elevator is 20 m. Calculate the individual capacity of bucket in litres 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=0.320 m.

[8+12]

Q7 **(a)** Describe the basic principles of operation of a positive pressure system pneumatic conveying. If necessary, give figures to enumerate this.
(b) Discuss the advantages and disadvantages of hydraulic conveyor?

(c) What are the major advantages of overhead travelling crane?

[10+6+4]