

B.E. MECHANICAL ENGINEERING FOURTH YEAR SECOND SEMESTER - 2025
MATERIAL HANDLING

Time: 3 Hours

Full Marks: 100

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

Answer any FIVE (5) Questions

- Q1. (a) What are the basic objectives of materials handling systems? Explain the advantages and disadvantages of material handling?
 (b) Discuss advantages and disadvantages of unitization of load.
 (c) Discuss briefly any five principles of Material Handling System. [6+4+10=20]
- Q2. (a) What is a conveyor? State the applications of conveyors in materials handling. Discuss the advantages and disadvantages of pneumatic conveyor and hydraulic conveyor.
 (c) Calculate the conveying capacity of a troughed belt conveyor if B = belt width = 500mm, V = 1200mm/sec, γ = bulk density is 2000 tonnes/m³, ϕ = static angle of repose is 45°. λ = 60°. [12+8=20]
- Q3. (a) A Screw conveyor is to be designed to convey moulding sand at an inclination of 15° 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) Explain the typical applications of screw conveyor. Sketch different profiles used in screw conveyor. State the restrictions in screw conveyor system. [12+8=20]
- Q4. (a) In a neat sketch, show the general arrangement of a belt conveyor system and label the different important parts.
 (b) Explain total resistance to motion take place in case of unpowered roller conveyor. [6+14=20]
- Q5. (a) Explain with neat sketches, any two types of buckets used in bucket elevators and state their uses.
 (b) Draw neatly the feeding and discharging arrangement of a directed gravity discharge type of bucket elevator. Label the diagram.
 (c) 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/m³.
 (iii) elevator speed = 0.83 m/sec
 (iv) bucket spacing = 0.320 m. [7+6+7=20]

[Turn over

- Q6. (a) How industrial trucks are classified? Explain different parts of fork lift trucks with sketch. Briefly explain the use of fork lift trucks.
 (b) What is a tractor? Explain wheel type and crawler type tractors with application areas Differentiate between tractor and trailer.
 (c) The rated capacity of a FLT is 2000 kg and load centre is 450 mm. The distance between front wheels to heel of the fork is 350 mm. If a load is to be carried whose c.g. is at a distance of 550 mm from the heel of the forks, then calculate the maximum safe weight “W” that can be carried. [6+6+8=20]
- Q7. Write Short Notes (any two) [10×2=20]
 (i) Electric Overhead Traveling (EOT) Crane
 (ii) Vibratory Conveyor
 (iii) Shrink wrapping vs. Stretch wrapping
 (iv) Robot applications in material handling.
