B.E. MECHANICAL ENGINEERING FOURTH YEAR SECOND SEMESTER - 2024

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 advantages and disadvantages of material handling? What are the functional scopes of material handling within an industry?
(b) What is bulk material? What is bulk density? What is packing co-efficient? What is the flowability? How does bulk weight of a bulk material differ from its specific weight? What is static and dynamic angle of repose?
(b) Discuss advantages and disadvantages of unitization of load.
[6+11+3=20]

Q2. (a) Write down any four principles of Material Handling System. Discuss in detail.
(b) Write different types of powered and non-powered industrial vehicle/truck.
(c) Rated capacity of FLT is 2000 kg and load centre is 550 mm. Distance between front wheel to heel of the fork is 450 mm:
(i) Find out true capacity of FLT
(ii) If load is carried whose centre of gravity is at distance 650 mm from heel of fork, then find out maximum safe weight. [8+6+6=20]

Q3. (a) Write down the major points in selection and design of a belt conveyor. Determine required expression for belt width & belt tension.
(b) Why selection of idlers and its spacing is important in case of belt conveyor.
(c) Boxes of size 220mm×180mm×100mm have to be conveyed by a belt conveyor of sufficient belt strength, at the rate of 2500 boxes per hour. What is the belt size and speed of the conveyor? Keep a gap of 250 mm between two boxes.
(d) Calculate the conveying capacity of a troughed belt conveyor if B = belt width = 500mm, V = 1200mm/sec, γ = bulk density is 2 tons/m^3, static angle of repose is 45 degrees, λ=60 degrees. [4+3+7+6=20]

Q4. (a) What are the advantages and limitations of E.O.T. cranes? How this crane is specified? Show by schematic diagram, the essential parts of an E.O.T. crane and label the important parts.
(b) Explain total resistance to motion take place in case of unpowered roller conveyor.
[(8+12=20]

Q5. (a) Show with neat sketches, different types of buckets used on bucket elevators and state their uses. How the buckets are designated?
(b) Draw neatly the feeding and discharging arrangement of a directed gravity discharge type of bucket elevator. Label the diagram.
(c) A bucket elevator lifts dry powdered coal to a height of 30m. Calculate the handling capacity of the elevator on the basis of the following data:

(i) effective bucket capacity = 2.0 litres.
(ii) bucket spacing = 500 mm.
(iii) bulk weight of coal = 0.8 t/m^3
(iv) bucket filling factor = 0.75
(v) elevator speed =0.93 m/sec [7+6+7=20]

Q6. (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 50 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) Discuss the advantages and disadvantages of hydraulic conveyor? [15+5=20]

Q7. (a) Explain briefly major components of a robot.
(b) With neat sketch classify robotic manipulators.
(c) Discuss robot applications in material handling. [6+9+5=20]

Q8. Write short notes on any ***two*** of the following: [2×10=20]
(a) Material code as per IS: 8730:1997
(b) Pneumatic vs. Hydraulic conveyor
(c) Shrink wrapping vs. Stretch wrapping
(d) Vibratory Conveyor

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