MECHANICAL HANDLING OF MATERIALS
(MECH 4281)

Time Allotted : 3 hrs **Full Marks : 70**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

(i) Classification & codification of bulk material is specified by BIS specification number
(a) IS : 8730: 1997 (b) IS : 8731: 1997
(c) IS : 8730: 1987 (d) IS : 8731: 1987.

(ii) Flowability of a bulk material is generally determined by its
(a) angle of repose (b) weight per unit volume
(c) packing coefficient (d) all of these.

(iii) Based on air pressure, pneumatic conveying systems may be classified as
(a) dilute phase and dense phase
(b) blow vessels and air slides
(c) positive pressure, negative pressure, combined positive negative system
(d) none of these.

(iv) In the vibrating feeder, material is moved by
(a) circular motion (b) linear motion
(c) hopping motion (d) reciprocating motion.

(v) Moving a large load over some distance in a construction site is best done by
(a) truck mounted crane (b) crawler type crane
(c) EOT crane (d) any of these.

(vi) An essential requirement of a good MH system is
(a) capital expenditure
(b) scaleability of plant & equipment
(c) storing materials utilizing minimum space
(d) all of these.

(vii) To avoid the chance of toppling while lifting a load, out riggers are used in
(a) gantry crane (b) wharf crane
(c) crawler crane (d) truck mounted crane.

(viii) "Dollies "are multiple wheel hand trucks where the source of power is
(a) battery driven motor (b) manual with two handles
(c) manual, with no handle (d) none of these.

(ix) Robot is better suited over an EOT crane for
(a) shifting of material from one place to another in a job shop
(b) handling of jobs of irregular sizes and varying weights
(c) repetitive accurate positioning and loading of components in a machine
(d) none of the above.

(x) The choice of appropriate type of pneumatic conveying system depends upon
(a) bulk density and particle size (b) flowability
(c) abrasiveness (d) all of these.

Group – B

2. (a) Mention the advantages and disadvantages that are associated with unitization of load.

(b) Explain the objectives of Principles of Materials Handling. Mention any four such principles.

6 + (2 + 4) = 12

3. (a) Define: Unit load, bulk material, bulk density, packaging co-efficient, flowability of material. How a material is coded?

(b) What are the principle groups of MH equipment?

(5 + 3) + 4 = 12

Group – C

4. (a) Describe with a neat sketch the constructional features of a Troughed Belt conveyor.

(b) Boxes of size 220 mm × 180 mm × 100 mm have to be conveyed by a flat belt conveyor of sufficient belt strength, at the rate of 2500 boxes per hour. The boxes are placed with a gap of 250 mm between them and aligned in such a way that dimension 220 mm is along the

direction of belt movement. Calculate the belt size and the belt speed of the conveyor.

6 + 6 = 12

5. (a) What is the function of a Belt Tensioning device? Mention different types of belt tensioning devices.
What are the advantages and limitations of chain conveyor compared to a belt conveyor?

   (b) A screw conveyor is to be designed to convey moulding sand at an inclination of 20° with the horizontal. The required capacity is 60 tons per hour, length of conveying is 25 m, bulk density of sand 1.6 ton/cubic metre and is abrasive in nature, loading efficiency is 0.125, screw pitch = 1.0 D (where D = nominal diameter of screw), r.p.m. of the screw is 50 rpm, inclination factor is 0.65, progress resistance coefficient is 4. Find out:
Nominal diameter of screw in meter.

(1 + 3 + 2) + 6 = 12

Group – D

6. (a) What are the advantages of using steel wire ropes over chains?

   (b) Describe the effects the groove radius of a sheave has on the steel rope that passes over it.

   (c) What are the differences between 'Regular Lay' and 'Parallel Lay' ropes?

   (d) How is the rotation of a rope drum by the weight hanging from the rope is arrested when the rope drum is not being driven. Explain with a sketch.

3 + 3 + 2 + 4 = 12

7. (a) Describe with neat sketch working of an Electric Overhead Travelling Crane and label the important parts.
What are the major advantages of overhead travelling cranes?

   (b) What is a Winch? What is the use of Winch in a crane.

   (c) Draw the cross-section of a 6 × 7(6-1) CF steel wire rope and identify its components.

(4 + 2) + 2 + 4 = 12

Group – E

8. (a) Briefly discuss the operational characteristics of a "Fork Lift Truck".

   (b) Write short note with sketch on the following auxiliary equipment:
(i) Belt feeder, (ii) Trough gate.

6 + (3 + 3) = 12

9. (a) What are the major specifications of FLT? Briefly explain the use of FLT.

   (b) Rated capacity of an 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 the 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.

(4 + 2) + 6 = 12