MECHANICAL HANDLING OF MATERIALS
(MECH 4123)

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) In bulk material, bulk density is always _____ the density of a particle of the same material.
(a) greater than (b) less than (c) equal to (d) none of the above

(ii) Statement 1: It is generally not possible to change the direction of flow with belt conveyors.
Statement 2: Belt conveyors can not be used in the inclined position.
(a) True, True (b) False, False (c) True, False (d) False, True.

(iii) Impact idlers are used in a belt conveyor
(a) at the loading points (b) at the return point
(c) at an interval of 15 m on a conveyor run (d) none of these.

(iv) "Dollies" are multiple wheel hand trucks where
(a) two handles with four legs are provided
(b) two handles are provided
(c) no handle is provided
(d) the source of power is battery driven motor.

(v) 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.

(vi) The two arms of Forklift are called
(a) tail (b) gib (c) fork (d) head.

(vii) Rope drum is used in a
(a) EOT Crane (b) multi pulley system
(c) chain pulley block (d) gantry crane.

(viii) The hoisting equipment which is used for self-loading and shifting them to different places in a factory is
(a) Chain hoist (b) Fork lift (c) Jib crane (d) Gear hoist.

(ix) Packing coefficient is generally
(a) less than 0.7 (b) 0.7 to 1.00
(c) 1.05 to 1.52 (d) More than 2.00.

(x) As an unit load is moved by a level luffing crane, the height of the load from ground
(a) may increase or decrease (b) increases
(c) decreases (d) remains at same level.

Group – B

2. (a) Discuss the method of determining the lump size of a material by the distribution of particle sizes. List the major characteristics of bulk materials. [(CO1)(Understand/LOCQ)]
(b) Describe material flow principle with respect to material handling systems. Name the conveying system which can be used to handle gaseous elements. [(CO1)(Understand/LOCQ)]
(4 + 2) + (4 + 2) = 12

3. (a) The rated capacity of a FLT having load center 65 cm is 3000 kgs. The distance from the middle of the front wheel to the front face of the fork with the vertical mast is 35 cm. Calculate the true capacity of the FLT. [(CO2)(Evaluate/HOCQ)]
(b) Discuss the belt construction of a belt conveyor with a schematic diagram. [(CO2)(Understand/LOCQ)]
6 + 6 = 12

Group – C

4. (a) Briefly explain the basic principles of operation of a positive pressure system of low pressure pneumatic conveying with a sketch. [(CO3)(Understand/LOCQ)]
(b) Boxes of size 220 × 180 × 100 mm have to be conveyed by a 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. [(C03)(Evaluate)/HOCQ]
6 + 6 = 12

5. (a) Describe different major parts of a bucket elevator. [(CO3)(Understand/LOCQ)]
(b) Find out the conveying capacity of a three roller troughed belt conveyor, taking B= belt width in meters, V = velocity of belt in m/ sec, γ = bulk density of material in tons / m^3. [(CO3)(Analyze/IOCQ)]
6 + 6 = 12

Group – D

6. (a) What is a winch? What is the use of winch in a crane? [(CO4)(Understand/LOCQ)]
(b) Describe the constructional features of a winch. [(CO4)(Understand/LOCQ)]
6 + 6 = 12

7. (a) Discuss the advantages of the overhead travelling crane and level luffing system used in wharf cranes. [(CO4)(Understand/LOCQ)]
   (b) Name and explain the various types of Hoisting equipment. [(CO4)(Understand/LOCQ)]

(4 + 4) + 4 = 12

Group – E

8. (a) Discuss the use of 2 wheel hand trucks, multiple wheel hand trucks and hand lift trucks in materials handling. [(CO5)(Understand/LOCQ)]
   (b) List six types of attachments used in the Fork Lift Trucks and discuss the applications of those attachments. [(CO5)(Remember/LOCQ)]

(3 × 2) + 6 = 12

9. (a) Describe the working principle, classifications and applications of vibrating feeders. [(CO6)(Understand/LOCQ)]
   (b) Discuss in brief the most common types of MHE used by the industries. [(CO6)(Understand/LOCQ)]

6 + 6 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	81.25	6.25	12.5

Course Outcome (CO):

After the completion of the course students will be able to

1. State the importance of materials handling equipment and its classification
2. Design flat and troughed belt conveyor
3. Describe the constructional features and compute the conveying capacity of some conveyors
4. Explain the working principle of different hoisting equipment and their purpose
5. Describe the constructional features of different trucks and vehicles and interpret the carrying capacity of a Fork Lift Truck
6. Distinguish different types of auxiliary handling equipment and apply the knowledge of maintenance and safety in materials handling system.

*LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question.