

MATERIALS HANDLING
(MECH 4142)

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) One of the disadvantage of material handling system is
 - (a) cut down labour cost
 - (b) improve efficiency of production
 - (c) minimize accident
 - (d) additional capital cost.
- (ii) Reactive and corrosive materials are generally carried by
 - (a) flat belt conveyor
 - (b) troughed conveyor
 - (c) closed conveyor
 - (d) bucket conveyor.
- (iii) In the vibrating feeder, material is moved by
 - (a) circular motion
 - (b) linear motion
 - (c) hopping motion
 - (d) reciprocating motion.
- (iv) The fork lift attachment used for lifting loads using hook and sling is called
 - (a) clamp
 - (b) boom
 - (c) drum grab
 - (d) drum.
- (v) A level luffing crane is so called because
 - (a) loads can be lifted up to the level of the crane
 - (b) level of the load is changed by luffing
 - (c) the lifted load remains at the same level during luffing
 - (d) the crane operates on a level ground.
- (vi) Which one from the following is not the part of an Fork Lift Truck (FLT)?
 - (a) Chassis
 - (b) Mast
 - (c) Sheave
 - (d) Fork arm.
- (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) The determination of belt width for a flat belt conveyor does not depend on
 - (a) dynamic angle of repose
 - (b) belt speed
 - (c) bulk density of materials
 - (d) trough angle.
- (ix) Steel scrap can be lifted best by
 - (a) orange peel grab
 - (b) tongs
 - (c) clamshell grab
 - (d) hook.

- (x) Work envelop of a Cartesian coordinate robot is
(a) conical (b) parallelepiped (c) cylindrical (d) spherical.

Group – B

2. (a) Briefly describe the different methods of handling a unit load. [[CO1](Understand/LOCQ)]
(b) Mention the important technical and economic factors that should be considered in the selection of MH equipment. [[CO1](Remember)/LOCQ]
6 + 6 = 12
3. (a) Differentiate between hydraulic lifting mechanism and mechanical lifting mechanism with schematic diagram for a hand lift truck. [[CO2](Analyze/IOCQ)]
(b) Write down four major specifications of a fork lift truck. [[CO2](Understand/LOCQ)]
8 + 4 = 12

Group – C

4. (a) What are the advantages and limitations of chain conveyor compared to belt conveyor. [[CO3](Remember)/IOCQ]
(b) Find the nominal diameter of a screw for a conveyor which conveys wheat at the rate of 10 tonnes/hr horizontally. The pitch of the screw is 0.9 times the diameter of the screw. The flowability of grain is 0.4 and the bulk density of the material is 790 kg/m³. The speed of the screw is 50 rpm. [[CO3](Evaluate/HOCQ)]
6 + 6 = 12
5. (a) Discuss different parts of a belt conveyor with necessary schematic diagram of the parts. [[CO3](Understand/LOCQ)]
(b) Discuss the advantages of the pneumatic conveying system over other conveying systems. [[CO3](Understand/LOCQ)]
8 + 4 = 12

Group – D

6. (a) Write down the differences between regular lay and lang lay rope systems. [[CO4](Analyze/IOCQ)]
(b) Describe with a neat sketch of Toplis mechanism of level luffing system for a wharf crane. [[CO4](Understand/LOCQ)]
4 + 8 = 12
7. (a) Discuss the advantages of using steel wire rope compared to chains? [[CO4](Analyze)/IOCQ]
(b) In an EOT crane, number of falls of the rope is 8. The pay load is 80 ton; weight of the bottom block is 3% of the pay load. Frictional loss per fall is 2.5%. Taking a factor of safety of 6, calculate the design load per fall of the rope. [[CO4](Evaluate)/HOCQ]
4 + 8 = 12

Group – E

8. Write short notes on the following with suitable sketches:
(i) vibratory feeder (ii) screw feeder (iii) chutes (iv) trough gate.
[[CO6](Remember)/IOCQ]
(3 + 3 + 3 + 3) =12
9. (a) Name the major components of the robots with their functions.
[[CO5](Remember)/LOCQ]
(b) Briefly describe the maintenance procedure of cranes and hoist.
[[CO6](Understand/LOCQ)]
6 + 6 = 12
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Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	62.5	22.92	14.88

Course Outcome (CO):

- After the completion of the course students will be able to
- 1. State the importance of materials handling equipment, its classification and select appropriate material handling equipment.
 - 2. State the constructional features of different trucks and vehicle
 - 3. Describe the constructional features and designs of conveyor systems
 - 4. Explain the working principle of different hoisting equipment and their purpose
 - 5. Implement automation and robotics in materials handling system
 - 6. Distinguish different types of auxiliary handling equipment and apply the knowledge of maintenance and safety in materials

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

