

**MECHANICAL HANDLING OF MATERIALS
(MECH 4123)**

Time Allotted : 2½ hrs

Full Marks : 60

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
any 4 (four) from Group B to E, taking one from each group.*

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

Group – A

1. Answer any twelve:

12 × 1 = 12

Choose the correct alternative for the following

- (i) Idlers are used in
(a) belt conveyors (b) chain conveyors
(c) bucket elevators (d) both (a) and (b).
- (ii) Principle of 'Unit Load' states that
(a) materials should be moved in lots
(b) materials should be moved in batches
(c) one unit should be moved at a time
(d) both (a) and (c).
- (iii) Dynamic loading phenomena is common in
(a) belt conveyors (b) chain conveyors
(c) screw conveyors (d) pneumatic conveyors.
- (iv) Pneumatic conveyors are generally used for conveying
(a) packaged goods (b) granular material
(c) mineral ores (d) heavy goods.
- (v) The following is used to transport materials having flat bottoms
(a) belt conveyors (b) roller conveyor
(c) chain conveyor (d) screw conveyor.
- (vi) Chains for MH equipment are generally made of
(a) carbon steel (b) cast iron
(c) wrought iron (d) mild steel.
- (vii) Belt conveyors can operate with an inclination (up or down) depending on the _____ of the load conveyed.
(a) frictional property (b) weight
(c) density (d) volume

- (viii) Troughed belt conveyors have _____ carrying capacity than flat belt conveyors of equal belt width.
 (a) more (b) less
 (c) equal (d) both (b) and (c)
- (ix) Generally apron or pan type chain conveyors are used to perform severe duties of conveying large quantities of _____ load.
 (a) bulk (b) unit
 (c) liquid (d) both (b) and (c)
- (x) Rope drum is used in
 (a) a gantry crane (b) an EOT crane
 (c) a chain pulley block (d) multi pulley system.

Fill in the blanks with the correct word

- (xi) Chutes and gates are _____ category of handling devices.
- (xii) For simultaneous mixing and conveying purpose _____ conveyor is used.
- (xiii) Unpowered roller conveyors use _____ force to convey loads in one direction.
- (xiv) _____ is similar to idle time principle.
- (xv) The hoisting equipment which is used for self-loading and shifting them to different places in a factory is _____.

Group - B

2. (a) Define the term “ Materials Handling”. [[CO1](Remember)/LOCQ]
 (b) Discuss the importance of Materials Handling. [[CO1](Understand)/LOCQ]
 (c) “A good layout ensures least material handling and less costly material handling equipment”- Justify the statement. [[CO1](Analyse)/IOCQ]

2 + 4 + 6 = 12

3. (a) Classify fixed path and variable path MH equipments with their usages. [[CO1](Remember)/IOCQ]
 (b) Calculate the conveying capacity of free flowing bulk material, being conveyed through a flat belt conveyor at 3.5 m/s. Given, belt width B=800 mm, Static angle of repose $\Phi=20^\circ$, bulk density 1.1ton/m³. Assume all necessary data conforming design guidelines for safe design. [[CO2](Evaluate)/HOCQ]

6 + 6 = 12

Group - C

4. (a) With the help of a neat sketch, describe the constructional features of aprony type chain conveyors. [[CO3](Remember)/LOCQ]
 (b) Specify the various characteristic features of gravity roller conveyors. [[CO3](Understand)/LOCQ]

6 + 6 = 12

5. (a) Describe the working principle of bucket elevators. [[CO3](Understand/LOCQ)]
 (b) Discuss the advantages and disadvantages of pneumatic conveyors. [[CO3](Analyse/IOCQ)]
6 + 6 = 12

Group - D

6. (a) What are the major advantages of using steel wire rope compared to chains. [[CO4](Apply/HOCQ)]
 (b) What is a winch? [[CO4](Remember/LOCQ)]
 (c) Discuss in brief the use of winch in a crane? [[CO4](Apply/IOCQ)]
6 + 2 + 4 = 12
7. (a) Describe with neat sketch the working principle of an EOT crane and label the important parts. [[CO4](Remember/LOCQ)]
 (b) Calculate the power of a crane in watts, which lifts a mass of 100 kg to a height of 10 m in 20 seconds. [[CO4](Evaluate/IOCQ)]
6 + 6 = 12

Group - E

8. (a) What are the main features of a FLT? Explain with a sketch. [[CO5](Analyse/HOCQ)]
 (b) 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 safe weight that the FLT is capable to carry. If the load centre is increased by 10 cm, what will be the new safe weight of the FLT? [[CO5](Evaluate/LOCQ)]
6 + 6 = 12
9. (a) Discuss the working principle, classifications and applications of vibrating feeders. [[CO6](Apply/IOCQ)]
 (b) Discuss the maintenance and safety aspects that are to be considered for the following MH equipments:
 (i) belt conveyor (ii) EOT cranes. [[CO6](Analyse/IOCQ)]
6 + (3 × 2) = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	39	42	19

Course Outcomes (CO):

At the end of the course, a student will be able to

- CO1: State the importance of materials handling equipment and its classification
 CO2: Design flat and troughed belt conveyor
 CO3: Describe the constructional features and compute the conveying capacity of some conveyors
 CO4: Explain the working principle of different hoisting equipment and their purpose

- CO5: Describe the constructional features of different trucks and vehicles and interpret the carrying capacity of a Fork Lift Truck
- CO6: 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.*