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) Impact idlers are used in a belt conveyor at
(a) the loading points (b) the return point
(c) an interval of 15 m on a conveyor run (d) at mid point

(ii) One of the disadvantage of material handling system
(a) cut down labour cost (b) improve efficiency of production
(c) minimize accident (d) additional capital cost

(iii) 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)

(iv) Dynamic loading phenomena is common in
(a) belt conveyors (b) chain conveyors
(c) screw conveyors (d) pneumatic conveyors

(v) 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

(vi) 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

(vii) Steel scrap can be lifted best by
(a) orange peel grab (b) tongs
(c) clamshell grab (d) hook

(viii) Which of the following is a type of hoisting equipment?
(a) Conveyor belt (b) Crane
(c) Roller (d) Forklift

(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) long distance movement of materials

(x) Feeders are used for
(a) manual handling of unit size of materials
(b) continuous and controlled flow of bulk materials from a storage to a MH equipment or to a processing equipment
(c) intermittent flow of materials
(d) movement of materials of very high volume

Fill in the blanks with the correct word

(xi) _____ is the mass capacity of a flat belt conveyor if volumetric capacity 0.55 m3/hr? (ρ = 1500 kg/m3)

(xii) _____ type unpowered roller conveyors are used to convey load in one direction only.

(xiii) Hoisting equipment is usually _____equipment used for lifting and lowering units and varying loads intermittently.

(xiv) Jib crane is a _____crane consisting of a vertical member.

(xv) Two ends of a belt may be joined by _____

Group - B

2. (a) 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 Φ=20°, bulk density 1.1 tons/m^3. Assume all necessary data conforming design guidelines for safe design. *[(CO3)(Apply/IOCQ)]*

(b) Discuss the importance of Material Handling systems. *[(CO1)(Understand/LOCQ)]*

6 + 6 = 12

3. (a) The power required at the driving pulley for driving the belt is 6 kW. The tension in the slack side is 500N and coefficient of friction between driving pulley and belt is 0.4 and angle of wrap at driving pulley is 210°. Calculate the tension in the tight side and belt speed in m/sec. *[(CO2)(Apply/IOCQ)]*

(b) Explain the advantages and disadvantages of load unitization with suitable examples. *[(CO1)(Understand/LOCQ)]*

6 + 6 = 12

Group - C

4. (a) Discuss the advantages and disadvantages of a Pneumatic Conveyor. *[(CO3)(Understand/LOCQ)]*

   (b) Differentiate between unpowered roller conveyor and powered roller conveyor. *[(CO3)(Understand/LOCQ)]*

6 + 6 = 12

5. (a) Calculate the safe volumetric capacity of a screw conveyor inclined at 10° to the horizontal plane, having 200mm nominal screw diameter, and screw pitch of 160mm, running at 100 rpm. Given, loading efficiency of the vertical cross sectional area Φ=0.25 and inclination factor C=0.8. *[(CO3)(Apply/IOCQ)]*

   (b) Write a short note on an unpowered roller conveyor. *[(CO3)(Understand/LOCQ)]*

6 + 6 = 12

Group - D

6. (a) A mobile crane supported on 4 wheels has a slewing centre equidistant from both the wheels. The following data are given for this crane:
   Wheel centre to centre distance = 4 m
   Boom length = 15 m
   Static tipping load at 5 m radius =10 T (boom in forward direction)
   Calculate the SWL at 8 m radius if Stability Margin is kept 25%. *[(CO4)(Apply/IOCQ)]*

   (b) Draw the cross section of a 6 x 7(6-1) CF steel wire and identify its components. *[(CO4)(Understand/LOCQ)]*

8 + 4 = 12

7. (a) In an EOT crane, the number of falls of the rope is 8. The payload is 80 tons, and the weight of the bottom block is 3% of the payload. Frictional loss per fall is 2.5%. taking a factor of safety of 6, calculate the design load per fall of the rope. *[(CO4)(Apply/IOCQ)]*

   (b) Differentiate between Regular lay rope and Parallel lay rope. *[(CO4)(Analyze/IOCQ)]*

8 + 4 = 12

Group - E

8. (a) The rated capacity of a FLT having a load centre of 60 cm is 2000 Kgs. The distance from the middle of the front wheel to the front face of the fork with the vertical mast is 30 cm. Calculate the safe load capacity of the FLT if the load centre is increased by 15 cm. *[(CO5)(Apply/IOCQ)]*

   (b) Discuss different types of attachments used in fork lift trucks. *[(CO5)(Understand/LOCQ)]*

6 + 6 = 12

9. (a) Discuss the factors which determine the importance of materials handling activity in an organization. *[(CO6)(Understand/LOCQ)]*

(b) Discuss in brief the most common types of MHE used by the industries and their maintenance with safety aspects. *[(CO6)(Understand/LOCQ)]*

6 + 6 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	54.17	45.83	0