MATERIALS HANDLING
(MECH 4142)

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) A truck is used to move
(a) unit load (b) bulk load
(c) both unit load and bulk load (d) stack of unit load

(ii) All of the following are free flowing materials except:
(a) Wheat (b) Soda ash
(c) Mica, pulverized (d) Lead salts

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

(iv) Reactive and corrosive materials are generally carried by
(a) flat belt conveyor (b) troughed conveyor
(c) closed conveyor (d) bucket conveyor

(v) Idlers are used in
(a) belt conveyors (b) chain conveyors
(c) bucket elevators (d) both (a) and (b)

(vi) Pneumatic conveyors are generally used for conveying
(a) packaged goods (b) granular material
(c) mineral ores (d) heavy goods

(vii) Rope drum is used in a
(a) EOT crane (b) Gantry crane
(c) Level Luffing crane (d) jib crane

(viii) 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

(ix) Chutes and gates comes under the category of
(a) hoisting equipment (b) conveyor
(c) auxiliary equipment (d) industrial trucks and vehicles

(x) Round shaped troughs are used for
(a) bulk materials handling (b) handling of small componets
(c) symmetrical materials (d) irregular shape of materials

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

(xiii) Rotating cranes can be rotated through _____degree about a vertical axis.

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

(xv) Cranes mounted on a base equipped with crawler treads for travel are called _____ crane.

Group - B

2. (a) Discuss different types of attachments used in fork lift trucks. *[(CO2)(Understand/LOCQ)]*
(b) Write a short note on hand lift trucks with schematic diagrams.
[(CO2)(Understand/LOCQ)]
6 + 6 = 12

3. (a) 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)]
(b) The rated capacity of a FLT having load centre 50 cm is 4000 Kgs. The distance from the middle of the front wheel to the front face of the fork with the vertical mast is 25 cm. Calculate the safe weight that the FLT is capable of carrying. If the load centre is increased by 10 cm, what will be the new safe weight of the FLT?
[(CO2)(Apply/IOCQ)]
6 + 6 = 12

Group - C

4. (a) A screw conveyor is to be designed to convey moulding sand at an inclination of 20° with the horizontal. The length of the conveyor is 25 m and the nominal diameter of the screw is 550 mm. Bulk density of sand may be taken as 1.6 tones/cubic metre and is abrasive in nature. Assume loading efficiency as 0.125. Screw pitch = 1.0 times the nominal diameter of the screw, r.p.m. of the screw is 50 rpm and inclination factor is 0.65, progress resistance coefficient is 4.
Find out:
(i) Capacity of the screw conveyor.
(ii) Total power required for the conveyor in kW. *[(CO3)(Apply/IOCQ)]*

(b) What are the advantages and limitations of a chain conveyor compared to a belt conveyor? *[(CO3)(Understand/LOCQ)]*

6 + 6 = 12

5. (a) Describe the working principle of bucket elevators. *[(CO3)(Understand/LOCQ)]*

(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 7900 kg/m3. The speed of the motor is 450 rpm. *[(CO3)(Apply/IOCQ)]*

6 + 6 = 12

Group - D

6. (a) Describe with a schematic diagram the Toplis mechanism of a Level Luffing system. Name a crane where a level luffing system is used. *[(CO4)(Understand/LOCQ)]*

(b) What are the advantages of using steel wire ropes over chains? *[(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) Differentiate between automatic system and manually operated system in the context of MH. *[(CO5)(Analyse/LOCQ)]*

(b) How do you distinguish between mechanization and automation in the MH system? *[(CO5)(Remember/LOCQ)]*

6 + 6 = 12

9. Write short notes on:
   (i) Vibratory feeder
   (ii) Screw feeder
   (iii) Chutes
   (iv) Troughgate

[(CO6)(Analyse/HOCQ)]

(3 + 3 + 3 + 3) = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	56.25	31.25	12.5