MATERIALS HANDLING
(MECH 3263)

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) Clamshell grab is usually used for lifting
(a) unit loads (b) steel structures
(c) bulk materials like coal (d) steel scrap.

(ii) 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.

(iii) The largest area can be covered inside a workshop by using a
(a) mobile crane (b) jib crane
(c) EOT crane (d) any one of the above.

(iv) In the vibrating feeder, material is moved by
(a) circular motion (b) linear motion
(c) hopping motion (d) reciprocating motion.

(v) Loads are usually classified into
(a) pay load and bulk load (b) pallet load and hoisting load
(c) unit load and bulk load (d) none of these.

(vi) Most preferred MH equipment used for simultaneous mixing & conveying purpose is
(a) pneumatic conveyor (b) screw conveyor
(c) bucket elevator (d) belt conveyor.

(vii) 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) none of these.

(viii) Belt conveyors are operated in
(a) inclined plane
(b) horizontal plane
(c) combination of horizontal & inclined plane
(d) all of these.

(ix) Packing coefficient is generally
(a) less than 0.7 (b) 0.7 to 1
(c) 1.05 to 1.52 (d) more than 2.

(x) Robot is better suited over an EOT crane for
(a) repetitive accurate positioning and loading of components in a machine
(b) handling of jobs of irregular sizes and varying weights
(c) handling very heavy jobs
(d) all of above.

Group – B

2. (a) State the common characteristics of materials in considering MH practices in a plant.

(b) Mention the advantages and disadvantages that are associated with unitization of load.

6 + 6 = 12

3. (a) Mention the factors that have to be considered in the selection of MH equipment.

(b) Enlist important principles of a good MH System and discuss any four of these principles.

6 + 6 = 12

Group – C

4. (a) What are the main features of an FLT? Explain with a sketch.

(b) What is the mechanism for counter balancing an FLT?

(c) Mention two types of hand trucks that are mostly found in
(i) railway platforms (ii) hospitals (iii) shopping Malls (iv) airports.

6 + 2 + 4 = 12

5. (a) What do you understand by "Auxiliary MH Equipment"?

(b) Mention the names of six types of Auxiliary MH equipment.

(c) Explain with necessary sketches the principle of operation of three types of Gates that are used in conjunction with the storage of bulk materials.

2 + 4 + 6 = 12

Group – D

6. (a) Calculate the conveying capacity of a belt conveyor if B = Belt Width = 500 mm, V = 1200 mm/sec, γ = Bulk Density = 2 tons/m^3 and the static angle of repose is 45^0.

(b) A screw conveyor is to be designed to convey moulding sand at an inclination of 15^0 with the horizontal. The required capacity is 50 tons per hour and the length of conveying is 25 m. bulk density of sand is 1.6 ton/m^3 and is abrasive in nature, loading efficiency is 0.125, screw pitch = 1.0 D (where D = nominal diameter of screw), r.p.m. of the screw is 50, inclination factor is 0.70, determine the nominal diameter of the screw.

6 + 6 = 12

7. (a) What are the advantages and limitations of chain conveyor compared to belt conveyor?

(b) Show the general arrangement of a belt conveyor system and label the different important parts with a neat sketch.

(c) A horizontal belt conveyor has the following specifications:

Belt Speed	: 2.65 m/s
Bulk Density of material	: 1300 Kg/m^3
Width of the Belt	: 1000 mm
Cross-sectional area of bulk material on the Belt	: 0.0771 m^2

Determine the weight of the material that can be conveyed per hour.

3 + 6 + 3 = 12

Group – E

8. (a) Describe with a schematic diagram working mechanism of a Level Luffing wharf crane. Why is it called Level Luffing?

(b) What are the advantages of using steel wire ropes over chains?

(c) How is the rotation of a rope drum by the weight hanging from the rope is arrested when the rope drum is not being driven. Explain with a sketch.

6 + 3 + 3 = 12

9. (a) Describe with neat sketch working of a Clamshell Grab. What are the types of material it can handle?

(b) What is "margin of stability" of a mobile crane?

(c) A mobile crane supported on 4 wheels has slewing centre equidistant from both the wheels. Following data are given for this crane:
Wheel centre to centre distance = 4 m
Boom length = 15m
Static tipping load at 5m radius = 10 T (boom in forward direction)

Calculate the S.W.L at 8m radius if Stability Margin is kept at 25%.

4 + 2 + 6 = 12