B.TECH/CE/7TH SEM/MECH 4123/2021

MECHANICAL HANDLING OF MATERIALS
(MECH 4123)

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) A belt conveyor is used for the following application [(CO2)(Understand /LOCQ)]
(a) Material transportation over long distances
(b) Material transportation within premises
(c) Material transportation for processing
(d) All of the mentioned.

(ii) Statement 1: In the specifications of a screw conveyor, the shaft length is shorter than the screw length.
Statement 2: Screw conveyors can carry more load compared to belt conveyors. [(CO3)(Understand/LOCQ)]
(a) True, True (b) False, False
(c) True, False (d) False, True.

(iii) Pneumatic conveying is done under the conditions of [(CO3)(Understand /LOCQ)]
(a) High pressure (b) Vacuum
(c) Fluidization (d) Any of the mentioned above.

(iv) Loads are usually classified into [(CO2)(Understand/LOCQ)]
(a) pay load and dead load (b) unit load and bulk load
(c) pallet load and hoisting load (d) all of the above.

(v) What is the mass capacity of flat belt conveyor if volumetric capacity 0.55 m^3/hr? (ρ = 1500 kg/m^3) [(CO2)(Apply/IOCQ)]
(a) 825 tons/hr (b) 825 kg/hr
(c) 2.727 tons/hr (d) 2722 kg/hr.

(vi) The following is supported from the ceilings [(CO3)(Understand/LOCQ)]
(a) Roller conveyor (b) Belt conveyor
(c) Chain conveyor (d) All of the above.

(vii) Hoisting drum of a crane usually made of [(CO4)(Understand/LOCQ)]
(a) Mild steel (b) Gray Cast Iron
(c) Carbon steel (d) All of the above.

(viii) Fork lift truck is used for [(CO5)(Understand/LOCQ)]
(a) lifting and lowering (b) vertical transportation
(c) horizontal transportation (d) all of the above.

(ix) Among the following select the four-wheeled vehicle used for material handling [(CO5)(Understand/LOCQ)]
(a) Single-girder crane (b) Travelling wall crane
(c) Pillar jib crane (d) Industrial fork-lift.

(x) In vibrating feeder, material is moved by [(CO6)(Understand/LOCQ)]
(a) Circular motion (b) linear motion
(c) hopping motion (d) reciprocating motion.

Group – B

2. (a) Discuss the importance of Material Handling systems. [(CO1)(Understand/LOCQ)]
(b) Describe Gravity Principle and Space Utilization Principle with respect to material handling systems. [(CO1)(Understand/LOCQ)]

6 + 6 = 12

3. (a) Discuss different types of Take-up Arrangements used in the belt conveying system with a neat sketch. [(CO2) (Understand /LOCQ)]
(b) The power required at the driving pulley for driving the belt is 6 kW. The tension in the slack side is 500N and co-efficient 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)]

6 + 6 = 12

Group – C

4. (a) Differentiate between Centrifugal Discharge Elevator and Continuous Elevator with a neat sketch. [(CO3) (Analyze/IOCQ)]
(b) Describe the use and constructional features of the apron type chain conveyor. [(CO3) (Understand/LOCQ)]

6 + 6 = 12

5. (a) Discuss the advantages and disadvantages of a Pneumatic Conveyor. [(CO3) (Understand/LOCQ)]
(b) Briefly explain the principles of operation and essential components of a Screw Conveyor with a neat sketch. [(CO3) (Understand/LOCQ)]

6 + 6 = 12

Group – D

6. (a) Explain the working principle of Grab Bucket with a neat sketch. [(CO4) (Understand/LOCQ)]
   (b) Describe the working principle of Hand operated Hoists and Electric Hoists. [(CO4) (Understand/LOCQ)]

6 + 6 = 12

7. (a) Classify different types of Cranes used in Materials Handling and discuss the uses of the cranes. [(CO4) (Understand/LOCQ)]
   (b) Describe with a neat sketch working of an Electric Overhead Travelling Crane and label the important parts. [(CO4) (Understand/LOCQ)]

4 + 8 = 12

Group – E

8. (a) Describe the Hydraulic Lifting Mechanism and Mechanical Lifting Mechanism used in Hand Lift Trucks. [(CO5) (Understand/LOCQ)]
   (b) A battery operated Fork Lift Truck weighs 6000 pounds including weight of battery and operator. It is carrying a weight of 2000 pounds. The truck lifts the load to 4 ft and carries the load to a distance of 200 ft of which 170 is along level road and balances 30 ft on an downgrade of 6%. After discharging the load it returns over the same route. Calculate total watt-hours of energy required to make 200 such trips daily. (Use the below table to solve the problem)
   Note: Approximate Watt Hours required by Fork Lift Trucks to travel on level concrete is given in Table 1. [(CO5) (Evaluate/HOCQ)]

Weight (Truck plus load in pounds)	Length of Run (Feet)											
	50	100	200	300	400	500	600	700	800	900	1000	1100
1,000	1.8	2.5	4	5.5	7	8.5	10.5	12	13.5	15	16.5	18
2,000	3.5	6	8	11	14	17	21	24	27	30	33	36
4,000	7	10	16	22	28	34	42	48	54	60	66	72
6,000	10.5	15	24	33	42	51	63	72	81	90	99	108
8,000	14	20	32	44	56	68	84	96	108	120	132	144
10,000	17.5	25	40	55	70	85	105	120	135	150	165	180
12,000	21	30	48	66	84	102	126	144	162	180	198	216
14,000	24.5	35	56	77	98	119	147	168	189	210	231	252
16,000	28	40	64	88	112	136	168	192	216	240	264	288
18,000	31.5	45	72	99	126	153	189	216	243	270	297	324
20,000	35	50	80	110	140	170	210	240	270	300	330	360

Table 1

6 + 6 = 12

9. (a) Differentiate between Slide Gate and Trough Gate with a neat sketch. [(CO6) (Understand/LOCQ)]
   (b) Discuss the importance of maintenance of materials handling equipment. [(CO6) (Understand/LOCQ)]

6 + 6 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	82.07%	12.26%	5.66%

Course Outcome (CO):

After the completion of the course students will be able to

CO 1	State the importance of materials handling equipment and its classification
CO 2	Design flat and troughed belt conveyor
CO 3	Describe the constructional features and compute the conveying capacity of some conveyors
CO 4	Explain the working principle of different hoisting equipment and their purpose
CO 5	Describe the constructional features of different trucks and vehicles and interpret the carrying capacity of a Fork Lift Truck
CO 6	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

Department & Section	Submission link:
CE A	https://classroom.google.com/c/NDA2MTU5OTE4OTgy/a/NDYzOTA3NjA0NzU4/details
CE B	https://classroom.google.com/c/NDA1MzUzMTU3OTI1/a/NDYzOTI0NDk3MDU3/details