Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – III • EXAMINATION – SUMMER • 2014

Subject code: 730904 **Date: 05-06-2014**

Subject Name: Design of Material Handling Equipments

Time: 02:30 pm - 05:00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Use of PSG design data book is permissible.**
5. **Draw neat sketch to justify your answer where necessary.**

Q.1	**(a)**	Explain the classification of materials handling equipments in brief. List and explain the factors to be considered for their selection.	**07**
	(b)	Explain the different of stresses induced in steel wire ropes. Also explain wire ropes selection in detail.	**07**
Q.2	**(a)**	State and explain the basic principles used for designing materials handling equipments in detail.	**07**
	(b)	Design a forged steel hook with modified triangular cross-section for useful load lifting capacity of the crane as 50 kN .The weight of the hook with grabbing tongs is 10 kN. The permissible stress for hook material is 230 MPa.	**07**
		OR	
	(b)	Define and explain storage space utilization. Also discuss its relation with materials handling equipments.	**07**
Q.3	**(a)**	Discuss bucket elevator design in detail.	**07**
	(b)	Explain the design of an E.O.T. crane main girder (box type) in detail.	**07**
		OR	
Q.3	**(a)**	Explain the stability analysis of a moveable crane with a neat sketch.	**07**
	(b)	Design of the E.O.T. main girder (double girder box type) for the following specifications: Useful load to be lifted = 240 kN Weight of hook = 4 kN Weight of crab = 6.5 kN Span = 13.7 m Height of lift = 4 m Hoisting speed = 1.5 m/min Cross traverse speed = 10 m/min For box type cross section ï height to width ratio = 2.5 Steel plate thickness = 10 mm Design bending stress foe steel plate = 100 MPa Permissible deflection = span / 750	**07**
Q.4	**(a)**	Explain the dust extraction system used in belt conveyor in detail.	**07**

(b) A horizontal belt conveyor is used in conveying a coal in thermal power station. The capacity of the conveyor is 300 tph, at a belt speed of 2 m/sec. The material has a density of 800 kg/m^3. Use the following additional data : **07**

Material conveying horizontal length = 260 m
Surcharge factor for polyamide belt = 0.0725
belt tension and arc of contact factor for belt = 80
number of plies for polyamide belt = 3 Motor speed = 1440 RPM
Drive Efficiency = 92 % material factor for plies = 2
width of material storage on belt = (0.9B ï 0.05) m
Ultimate tensile strength for belt per unit length (width) per ply =60 N/m
Effective tight side belt tension on drive pulley = 8279 N
Effective slack side belt tension on drive pulley = 1911 N
Find (1) standard belt width (2) reduction ratio of gear reducer (3) power required to drive the belt conveyor (4) the power rating of standard electric motor (5) the available factor of safety

Standard data / values:

Standard motor ratings: 5, 5.5, 7.5, 10, 11, 12.5, 15, 20, 22, 25 kW.
Standard belt width (in mm):400, 500, 650, 800, 1000 and corresponding to **Belt mass (mB in kg/m)** of 5, 6.5, 9, 12 and 15.5 respectively.

OR

Q.4 **(a)** Explain the belt selection for belt conveyor in detail. **07**

(b) Draw a neat sketch of chain conveyor. State and explain its advantages and disadvantages compared to belt conveyor. **07**

Q.5 **(a)** Explain the constructional features and working of vibrating feeders. **07**

(b) Explain the design of double sided drum in detail with neat sketches. **07**

OR

Q.5 **(a)** Explain failure analysis procedure used for material handling equipment failure study. **07**

(b) Explain the economics of materials handling equipment design. **07**

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