Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – III • EXAMINATION – WINTER • 2013

Subject code: 730804 **Date: 28-11-2013**

Subject Name: Design of Material Handling Equipments

Time: 10.30 am – 01.00 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)**	Classify the cranes and state their applications with specific reasons (for selection) and limitations.	**07**
	(b)	Explain the selection of factor of safety for different material handling equipments in detail.	**07**
Q.2	**(a)**	Explain the different of stresses induced in steel wire ropes. Also explain its selection.	**07**
	(b)	Explain the design of an E.O.T. crane main girder (box type) based on strength and rigidity in detail.	**07**
		OR	
	(b)	Explain the dust extraction system used in belt conveyor in detail.	**07**
Q.3	**(a)**	Explain cage elevator design in detail.	**07**
	(b)	Design a steel wire rope – 8 x 19 for the elevator from the following data: No. of ropes = 4 acceleration of hoist = 0.844 m/sec^2 Maximum load capacity = 11.35 kN wire diameter = 0.05d Effective rope area = 0.35d^2 m^2 minimum sheave diameter = 31d Modulus of elasticity for rope = 80000 MPa tensile strength = 44.5d^2 Factor of safety = 8 weight of rope per meter= 3.4d^2	**07**
		OR	
Q.3	**(a)**	Draw a neat sketch of forklift truck and explain the design of fork and roller used in it.	**07**
	(b)	Explain the different safety devices used in elevators.	**07**
Q.4	**(a)**	Explain the design of main components of monorail hoist.	**07**
	(b)	Design a crane hook 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 215 MPa. Assume modified triangular cross-section for hook.	**07**
		OR	
Q.4	**(a)**	Draw a neat sketch of hoisting unit. Explain the selection of steel wire rope in detail.	**07**
	(b)	Explain the design of double sided drum in detail.	**07**
Q.5	**(a)**	Distinguish clearly between belt conveyor and chain conveyor. State the applications of pneumatic conveyor.	**07**
	(b)	A horizontal belt conveyor is used in conveying a coal in thermal power	**07**

station. The capacity of the conveyor is 225 tph, at a belt speed of 2 m/sec. The material has a density of 800 kg/m^3. Use the following additional data :
Material conveying horizontal length = 300 m
Surcharge factor for polyamide belt = 0.08
Coefficient of friction between belt and drive pulley = 0.4
pulley diameter = 125 x i
number of plies for polyamide belt i = 3 Motor speed = 1440 RPM
Drive Efficiency = 93 % material factor for plies = 2
width of material storage on belt = (0.9B – 0.05) m
Standard motor ratings: 5, 5.5, 7.5, 10, 11, 12.5, 15, 20, 22, 25 kW.
Standard belt width (in mm): 315**,**400, 500, 630, 800, 1000 and corresponding to **Belt mass (mB in kg/m)** of 5, 6.5, 9, 12 and 16 respectively.
Ultimate tensile strength for belt per unit length (width) per ply =60 N/m
Effective tight side belt tension on drive pulley = 10828.96 N
Effective slack side belt tension on drive pulley = 2499.76 N
Find (1) standard belt width (2) standard pulley diameter reduction ratio of gear reducer (3) power required to drive the belt conveyor (4) the power rating of standard electric motor (5) reduction ratio of gear reducer

OR

Q.5 **(a)** Explain the different types of load handling attachments alongwith their applications. **07**

(b) An inclined belt conveyor at an angle of 15^0 to the horizontal is used in transporting a mineral ore. The capacity of the conveyor is 825 kg/h, at a belt speed of 1.75 m/sec. The mineral ore material has a density of 1120 kg/m^3. Use the following additional data : **07**
Length of load carrying run of belt = 300.5 m
Drive Efficiency = 93 % width of belt = 800 mm
Motor speed = 1500 RPM Factor of safety for belt = 12
Coefficient of friction between belt and drive pulley = 0.45
pulley diameter = 125 x i
flowability factor for inclined belt conveyor = 2.65 x 10 $^{-4}$
Standard motor ratings: 5, 5.5, 7.5, 10, 11, 12.5, 15, 20, 22, 25 kW.
Standard pulley diameters (in mm): 315**,**400, 500, 630, 800, 1000
Standard belt width (in mm): 400, 500, 650, 800, 1000
corresponding to **Belt mass (mB in kg/m)** of 5, 6.5, 9, 12 and 16 respectively.
ultimate tensile strength for belt per unit length (width) per ply =80 N/m
mass of fabric ply belt per unit length = 12.5 kg/m
effective tight side belt tension on drive pulley = 11250 N
effective slack side belt tension on drive pulley = 2162 N
Find (1) standard belt width (2) power required to drive the belt conveyor (3)the power rating of standard electric motor (4) the no. of plies for fabric belt.

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