

Registration no:

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M.TECH  
MDPC201

**Second Semester Examination 2013**  
**BASIC MECHANICAL HANDLING SYSTEMS**

Time: 3 Hours

Max marks: 70

Answer Question No.1 which is compulsory and any five from the rest.

The figures in the right hand margin indicate marks.

Q.1. Answer the following questions:

2X10

(a) (a) Which method out of casting and forging is referred for manufacturing crane hook. Justify your answer.

(b) What is the effect of surface roughness of object on the capacity of electro-magnet?

(c) What do you mean by polygonal effect in sprocket and chain system?

(d) Where do you find application for pulley system with gain in force?

(e) Name one advantage and one disadvantage of a lifting electromagnet.

(f) What are the types of rope lays.

(g) Which gear pair is suitable for speed reduction of 40.

(h) What is meant by 6x7 wire rope?

(i) What is the purpose of two counter weights provided in elevators?

(j) Where does the failure in crane hook begin first?

Q.2 Design a crane hook assembly for a capacity of 30kN. Choose trapezoidal cross-section with bed diameter equal to 75mm. 10

Q.3 A temporary elevator is assembled at the construction site to raise building materials to a height of 30m. it is estimated that the maximum weight of the material to raised is 5 kN. It is observed that the acceleration in such applications is  $1.2\text{m/s}^2$ . 10mm diameter 6x19 construction wire ropes with fiber core is used for this application. Determine the number of wire ropes required in this case. Neglect the bending stresses and use the following data.

Mass of 100m wire rope=34.6 kg, Breaking strength of wire rope is 44 kN, Factor of safety=10, Calculate the factor of safety resulted if the bending stress is taken into account. Consider the following data for this case The sheave diameter =475mm=47.5 times rope diameter, Wire diameter=0.063xrope diameter, Cross-sectional area of rope= $0.4\times(\text{rope diameter})^2$ , Young modulus=8300N/mm<sup>2</sup>.

Q.4 (a) A simple chain No. 10B is used to transmit power from a transmission shaft running at 200 rpm to another shaft running at 100 rpm. There are 19 teeth on the driving sprocket wheel and the operation is smooth without any shock. Calculate 5

- (i) The power transmitting capacity of the chain drive;
- (ii) The chain velocity;
- (iii) The chain tension
- (b) Discuss the principal factors that affect selection of material handling equipments 5
- Q.5 (a) Give brief descriptions of crane attachments for handling liquid materials. 4
- (b) A ratchet wheel with teeth on outside is to transmit 300 N-m. The pitch circle diameter of the wheel is 100 mm. Determine module of the tooth assuming the following data. 6
- Linear unit pressure for engagement of pawl with tooth of ratchet wheel=147 kN/m
- Number of teeth on wheel=15, tooth thickness at root=one module, radial depth of tooth=0.75Xmodule.
- Q.6 (a) Explain the working of a Jib crane with schematic diagram. 5
- (b) A pair of worm and worm wheel is designated as 3/60/10/6. The worm is transmitting 7.5kW power at 1440 rpm to the worm wheel. The coefficient of friction is 0.15 and the normal pressure angle is  $20^\circ$ . Determine the components of the gear tooth force acting on the worm and worm wheel. 5
- Q.7 (a) A four-wheeled hand trolley with symmetric suspension is used for a crane to lift a load of 10 kN. The weight of the trolley is 2 kN. Determine the traction factor assuming the following data. Diameter of wheel=400 mm. diameter of journal=20 mm. coefficient of friction at journal=0.01, Coefficient of rolling friction=0.05 cm, 5
- (b) Briefly explain about Trackless travelling mechanisms 5
- Q.8 (a) Explain the design procedure of EOT crane. 5
- (b) It is required to select a flat belt drive for a compressor running at 720 rpm which is driven by a 20 kW 1440 rpm motor. The space is available for a centre distance of 2m. Select a suitable belt of open type. 5