Ref. No. : Ex/ME/T/422/2017(Old)

**Department of Mechanical Engineering**

**B. Mechanical 4th Year,2nd Semester Examination 2017**

**Mechanical Handling of Materials**

**Time:3 Hours** **Full marks-100**

***Answer any FIVE question(Assume any data if required)***

1. (a) Sketch only the modes of this charge for Bucket Elevators required for lifting the following materials. (i) Dry food grain (ii) Large lumped coal (iii) Wet saw dust (Label the sketches)

   (b) Determine the handling capacity of a bucket elevator on the basis of the following data.
   (i) Bucket capacity = $0.6m^3$ (ii) Bucket loading efficiency = 0.75
   (iii) Bucket elevator velocity = 0.25 m/sec (iv) Bucket Pitch = 0.3m
   (v) Bulk density of the material lifted = $0.4\ t/m^3$ (15+5= 20)

2. (a) Determine the motor power to drive and inclined screw conveyor on the basis of following information:
   (i)Diameter of screw = 0.3 m (ii) Screw pitch=0.25 m (iii) Trough loading efficiency = 20% (iv) Screw RPM = 35 (v) Length of the conveyor = 4.0 m
   (vi) Total resistance factor for the material = 2.0 (vii) Bulk density of material = $0.8\ t/m^3$
   (viii) Angle of inclination of the conveyor = $10^0$ (ix) Factor of inclination = 0.7

   (b) For Bucket Elevator prove that $h_p = 895/n^2$ , where n = rpm of the drive pulley or sprocket and $h_p$ = Polar distance (10+10 = 20)

3. Sketch for belt conveyors, the following items:
   (i)Double sided discharge plough for intermediate discharge arrangement of bulk materials. (Give two views)
   (ii) Screw –type belt tension take up device (Give two views)
   (iii) Single pulley drive for belt wrapping using binder belt(Mention in the sketch the relevant wrap angles approximately) 20

4. (a)Sketch a labeled diagram of a flight conveyor and show the sectional side view OR Write down the detail uses of roller conveyor in manufacturing industry.
   (b) State the merit, demerit and uses of flight conveyor. OR Draw the velocity time diagram of an Un-powered roller conveyor.
   © A horizontal belt conveyor with 3- roller troughing arrangements, handles lime stones of bulk density $1.5\ t/m^3$, at the rate of 20 tonnes / hour at a speed of 1.5 m/sec. The axis of the side troughing idler rollers are set at an angle of $20^0$ with the axis of central idler roller. Dynamic angle of repose of lime stone is $30^0$. Compute the width of the conveyor. (8+6+6 =20)

[ Turn over

5. (a) Draw the sketches of different types of screw profiles which are used to handle materials of different characteristics(Give side view also)
   (b) Draw the scheme of a pneumatic handling system in which the air pressure is below the atmospheric pressure(Label the sketch)
   © State the advantages and uses of pneumatic handling system (8+7+5=20)

6. (a) State the names of different types of hydraulic method of handling bulk materials.
   (b) Draw the sketch of a hydraulic method of handling system using sludge pump, sludge tank and filter collector.
   © Sketch an EOT crane with fabricated bridge girder having over running trolley( Label the sketch)
   (d)Calculate the hoist motor power of an EOT crane if the maximum mass to be lifted = 800kg, speed of hoisting is 0.3 m/sec. Assume reducing gear box efficiency 80%
   (Consider acceleration due to gravity for weight calculation) (3+6+6+5=20)

7. Draw different luffing arrangements of JIB cranes and state merit and de- merit those arrangements. OR
   Write down different uses of different types of JIB cranes with schematic diagram.
   20

8. Write short notes on any two of the following:
   (a) Trippers for intermediate discharge of belt conveyors
   (b) Multi pulley drive systems of belt conveyors
   (c) Apron conveyor for handling bulk conveyor
   (d) Long travel arrangement of EOT crane.