Bengal Engineering and Science University, Shibpur

B. E. (CST) Part-II 3rd Semester Examination, 2011

Subject: **Elements of Mechanical Engineering**

(ME-304)

Time: 2 Hours   Full Marks: 35

Use separate answerscript for each half,

*Answer any **Four** questions, taking **TWO** from each half,*

The questions are of equal value

First Half

1. a) What is locked chain. Give one example.

   b) A porter governor has equal arms each 250 mm long and pivoted on the axis of rotation. Each ball has a mass of 5.5 kg and the mass on the sleeve is 28 kg. The radius of rotation of the ball is 160 mm when the governor begins to lift and 220 mm when the governor is at maximum speed. Find the effort and power of the governor when the friction at the sleeve is equivalent to 12.5 N.

2. a) What is belt slip and creep? How does belt slip differ from creep?

   b) A flat belt drive is used to transmit power in a paddy crusher. The output power of the driven shaft is 108 KW. The diameters of the driving and driven pulleys are 950 mm and 1280 mm, respectively and the centre distance 3.5 m. The belt speed is 20 m/s and the coefficient of friction between the belt and the pulley is 0.25. Assume the frictional loss of the driving and driven shafts are 4.5% and 6.5%, respectively. Design the belt drive and find the characteristics dimensions. Assume data if any.

3. (a) Prove that the maximum fluctuation of energy,

   $$\Delta E = E \times 2\, C_S$$

   Where, E = mean K.E of the flywheel, and C_S = coefficient of fluctuation of speed.

   (b) A pair of gears having 20^0 pressure angle and full depth involute are in mesh. The number of teeth of the pinion is 28 and the gear ratio is 2. If the module is 5 mm and pitch

line velocity is 1.2 m/s, find: (i) the angle turned through by pinion when one pair of teeth is in mesh, and (ii) the maximum velocity of sliding.

Second Half

4. (a) Show with sketches the sectional representation and symbols for the following forms of weld: fillet, double V-butt, square butt and single bevel butt.

   (b) A steel plate 100 mm wide and 12.5 mm thick is to be welded to another similar plate by means of compound fillet welds. The plates are subjected to a load of 60 kN at a height of 85 mm and parallel to the width of the base plate. Find the length of the weld so that the maximum stress does not exceed 56 N/mm². Consider as static loading.

5. a) How do you classify the joints in Engineering and which joints are preferred?

   b) Two lengths of flat steel bar 18 mm thick are to be connected by a double cover butt joint to carry a load of 400 KN. Design and draw a neat dimensioned two views sketch of the joint. Assume the allowable stresses in tensile = 90 MPa, in shear = 75 MPa and in crushing = 150 MPa.

6. Write short notes in the following:

   (a) Gas metal arc welding

   (b) Vibration isolation

   (c) Pressure angle