IV—Sem/MECH/2018(S)(New)

THEORY OF MACHINES

(Code : MET-401)

Full Marks : 70

Time : 3 hours

Answer any **five** questions

Figures in the right-hand margin indicate marks

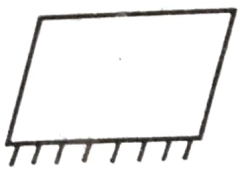
1. (*a*) Define Resistant body. 2

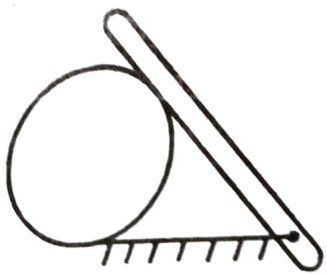
   (*b*) What is Turning pair, Sliding pair and Screw pair ? Give an example of each. 5

   (*c*) Sketch and explain the inversions of a four bar mechanism. 7

2. (*a*) What is a Link ? 2

   (*b*) Find out the dot of the following bar shown below : 5





(*c*) A casting weighing 9 kN hangs freely from a rope which make 2·5 turns round a drum of 300 mm diameter revolving at 20 rpm. The other end of rope pulley is pulled by a man. $\mu = 0{\cdot}25$. Determine

(*i*) The Force of required by Man

(*ii*) Power to raise the casting. 7

3. (*a*) What do you mean by reverted and epicyclic gear train ? 2

(*b*) Derive the expression for Condition of Maximum Power transmission in a belt drive. 5

(*c*) In a epicyclic gear train, and arm carries two gears A and B having 36 and 45 teeth respectively. If the arm rotates of 150 rpm. In the anticlockwise direction about the centre of gear A which is fixed. Determine the speed of gear B, if gear A is fixed and speed of gear B, when gear A rotates of 300 rpm in clockwise direction ? 7

4. (*a*) What is the function of flywheel ? 2

(*b*) Mass of a flywheel of an engine is 6·5 tonne and Reduce of gyration is 1·8 m. It found from the turning moment diagram that the fluctuation of energy is 56 kNm. If mean speed of engine is 120 rpm. Find maximum and minimum speeds. 5

(*c*) A Porter Governor has equal arms of 250 mm long and pivoted to the axis of rotation. Each ball has a mass of 5 kg and mass of sleeve load is 15 kg. The radius of rotation of the ball is 150 mm which begins to left and 200 mm when the governor is at maximum speed. Find minimum and maximum speeds ? 7

5. (*a*) What is a Bearing ? 2

(*b*) Derive the expression for torque transmission in a flat collar bearing by assuming Uniform Pressure Theory. 5

(*c*) A single plot clutch with both sides effective is used to run a machine through a shaft rotating at 240 rpm. Inner and outer

diameter of the lining are 120 mm and 240 mm. Maximum pressure should not exceed 120 kN/m^2. ($\mu = 0{\cdot}25$).
Find out (*i*) Torque transmitted through clutch.
(*ii*) Time to attain full speed if moment of Inertia is 7 kg m^2 (Assume UWT). 7

6. (*a*) What do you mean by Static Balancing ? 2

(*b*) How the static balancing of a single rotating mass is done by a single rotating mass ? 5

(*c*) How to determine the natural frequency of Free Longitudinal Vibration ? 7

7. (*a*) What do you mean by Free Vibration and Damped Vibration ? 2

(*b*) Classify the followers and explain briefly ? 5

(*c*) A shaft of length 0·75 m, supported freely at the ends carrying a load of 90 kg at 0·25 m from one end. Find the natural frequency of transverse vibration. Assume $E = 200$ GN/m^2 and $d = 50$ mm ? 7
