CBCS Scheme

Fourth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Theory of Machines

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions,
choosing ONE full question from each module.

Module-1

1 a. In case of an elliptical trammel, prove that any part other than the centre of the coupler road traces of perfect ellipse. **(08 Marks)**

   b. Define the mobility of a mechanism write the Grubler's criterion equation for mobility of a planar mechanisms. Also determine the mobility of the following cases. **(08 Marks)**
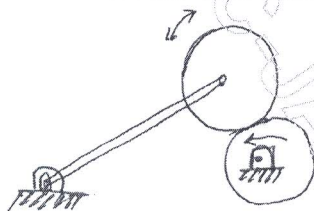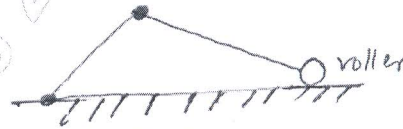

Fig.Q1(b)   Fig.Q1(a)

OR

2 a. Distinguish between the following :
   i) Machine and mechanism
   ii) Machine and structure
   iii) Complete and incomplete constrained motion. **(06 Marks)**

   b. i) What are quick return mechanisms? Where are they used. Explain with neat sketch of a witch worth quick return motion mechanism
   ii) In a crank and slotted lever mechanism, the length of a crank is 500mm and ratio of time is of cutting to return stroke 3.25. Determine the distance between the fixed centers and the length of the slotted lever. Given the length of the stroke is 200mm. **(10 Marks)**

Module-2

3 In a mechanism shown in Fig.Q3, determine the acceleration of slider C. given O, A = 100 mm, AB = 105mm, O, B = 150mm and BC = 300mm. Crank O, A rotates at 180 rpm. **(16 Marks)**
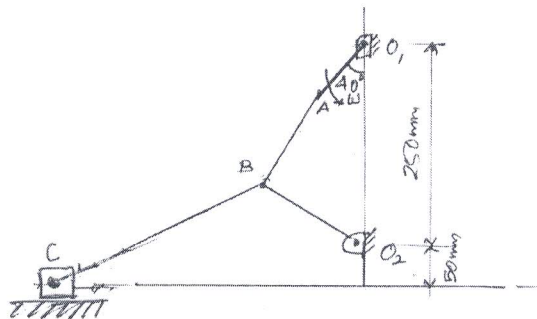

Fig.Q3

OR

4 a. What do you understand by coriolis component of acceleration? Drive the expression for evaluating if and explain how the direction is fixed? **(08 Marks)**

b. Fig.Q4(b) shows the scotch yoke mechanism. At instant shown figure, the crank OP has an angular velocity of 10 rad 1 sec. Determine velocity of the slide 'P'. **(08 Marks)**
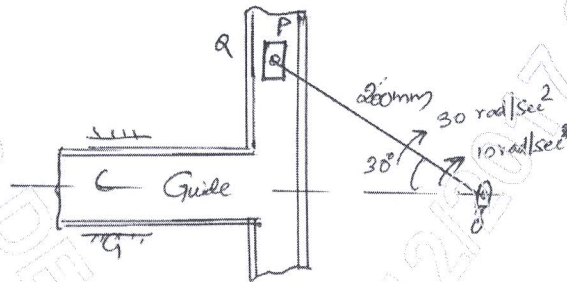

Fig.Q4(b)

Module-3

5 a. State the law of gearing. **(03 Marks)**

b. Find the minimum number of teeth on opinion of a 20° involute spur gear, which meshes externally with velocity ratio 3. The module is 3mm and addendum is equal to 1.1 module. **(05 Marks)**

c. An internal wheel B with 80 teeth is keyed to a shaft F. A fixed internal wheel C with 82 teeth is concentric with B. A component wheel D – E gears with two internal wheels; D has 28 teeth and gears with C while E gears with B. The compound wheels revolve freely on a pin which project from a disc keyed to shaft A coaxial with F, If the wheels have same pitch and shaft A makes 800 rpm, what is the speed of F? Sketch the gear train arrangement. **(08 Marks)**

OR

6 a. With neat sketch show the compound gear train and briefly explain how it differs from a simple gear than. **(06 Marks)**

b. i) Define the following gear terminologies i) module ii) diametral pitch iii) circular pitch iv) Back lash v) pressure angle vi) path of contact.

ii) The equal spur gears of 48 teeth mesh together with pitch radii of 100mm and the addendum are 4.25mm. If the pressure angle is 20°, calculate the length of action and contact ratio. **(10 Marks)**

Module-4

7 a. Derive the expression for the friction torque considering uniform wear theory for a flat collar. **(08 Marks)**

b. A pulley is driven by a flat belt 100mm wide and 6mm thick. The density of belt material is $1000 kg/m^3$. The angle of lap is 120° and coefft of friction 0.3. The maximum stress in the belt does not exceed 2 MPa. Find the maximum power that can be transmitted and corresponding speed of the belt. **(08 Marks)**

OR

8 a. Derive the expression for maximum power transmitted in a belt drive. **(08 Marks)**

b. A thrust shaft of a ship has six collars of 600mm external diameter and 300mm internal diameter. The total thrust from a propeller is 120 kN. If the coefficient of friction is 0.15 and speed of the engine is 100 rpm, find the power lost is friction at the thrust block, assuming i) uniform pressure and ii) uniform wear. **(08 Marks)**

Module-5

9   a. Deduce the expression for the velocity and acceleration of the follower when it moves with simple harmonic motion.   **(06 Marks)**

   b. What do you understand by tangent cam and deduce the expression for maximum velocity and acceleration of tangent cam having roller in contact with straight flank.   **(10 Marks)**

OR

10   A cam operates an offset roller follower. The least radius of the cam is 50mm, roller diameter is 30 mm and offset is 20mm. The cam rotates at 360 rpm. The angle of ascent is 48°, angle of dwell is 42° and angle of descent is 60°. The motion is to be SHM during ascent and uniform acceleration and deceleration during descent. Draw the cam profile. Also calculate the maximum velocity and acceleration during descent.   **(16 Marks)**

* * * * *