B.Tech. (M.E.) 4th Semester F. Scheme

Examination, May–2015

KINEMATICS OF MACHINE

Paper–ME-204-F

Time allowed : 3 hours]   *[Maximum marks : 100*

Note : *Attempt five questions in total at least one question from each section. All questions carry equal marks.* ***Question No. 1 is compulsory.***

1. Explain the following :   5×4
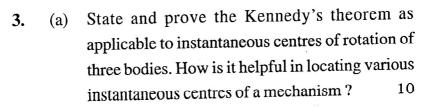
    (a) Mechanical advantage and transmission angle of a mechanism

    (b) Law of gearing

    (c) Path generation and function generation
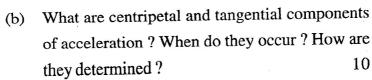
    (d) Pivot and collar friction.

Section–A

2. (a) Define Grashof's law. State how is it useful in classifying the four-link mechanism into different types.   10

    (b) Describe various inversions of slider-crank mechanism giving examples.   10

3. (a) State and prove the Kennedy's theorem as applicable to instantaneous centres of rotation of three bodies. How is it helpful in locating various instantaneous centres of a mechanism ? 10

   (b) What are centripetal and tangential components of acceleration ? When do they occur ? How are they determined ? 10

Section–B

4. The following data relate to a cam operating an oscillating roller follower : Minimum radius of cam = 44mm, Roller diameter = 14 mm, length of the follower arm = 40mm, distance of fulcrum centre from cam centre=50mm, Angle of ascent = 75°, Angle of descent = 105°, Angle of dwell for follower in highest position = 60°, angle of oscillation of follower = 28°. Draw the profile of the cam if the ascent and descent both take place with SHM. 20

5. Two 20° involute spur gears mesh externally and give a velocity ratio of 3. Module is 3mm and addendum is equal to 1.1 module. If the pinion rotates at 120rpm, determine (i) the minimum number of teeth on each wheel to avoid interference (ii) the number of pairs of teeth in contact. 20
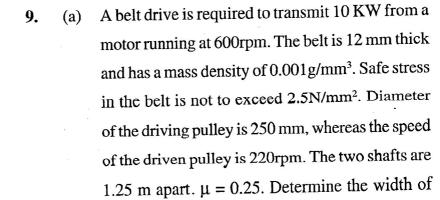
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Section–C

6.   Determine the suitable train of wheels to satisfy the requirements of a clock, the minute hand of which is fixed to a spindle and the hour hand to a sleeve rotating freely on the same spindle. The pitch is same for all the wheels and each wheel has at least 11 teeth. The total number of teeth should be as small as possible.   20

7.   Design a four link mechanism when the motions of the input and the output links are governed by a function $y = x^2$ and x varies from 0 to 2 with an interval of 1. Assume Θ to vary from 50° to 150° and $\varnothing$ from 80° to 160°.   20

Section–D

8.   (a)   In a screw jack, the diameter of the threaded screw is 40 mm and pitch is 8 mm. The load is 20KN and it does not rotate with the screw but is carried on a swivel head having a bearing diameter of 70 mm, $\mu = 0.08$ between the swivel head and spindle and $\mu = 0.1$ between screw and nut. Determine the total torque required to raise the load and the efficiency.
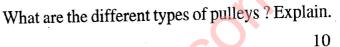   10

     (b)   Describe the working of a centrifugal clutch. 10

9. (a) A belt drive is required to transmit 10 KW from a motor running at 600rpm. The belt is 12 mm thick and has a mass density of $0.001 g/mm^3$. Safe stress in the belt is not to exceed $2.5 N/mm^2$. Diameter of the driving pulley is 250 mm, whereas the speed of the driven pulley is 220rpm. The two shafts are 1.25 m apart. $\mu = 0.25$. Determine the width of the belt. 10

(b) What are the different types of pulleys ? Explain. 10