



KERALA AGRICULTURAL UNIVERSITY
B.Tech. (Food Engg. & Tech.) - 2019 Admission

III Semester -Final Examination-February 2021

Meen. 2104

Kinematics of Machinery (2+1)

Marks: 50
Time: 2 hours

I Fill in the blanks

(10x1=10)

1. _____ mechanism is an inversion of double slider-crank chain.
2. A ball and a socket form a _____ pair
3. The co-efficient of dynamic friction is _____ than static friction.
4. In a clock mechanism, the gear train used to connect minute hand to hour hand is _____.
5. Energy is stored in a flywheel in the form of _____.

State whether True or False

6. The number of instantaneous centres of rotation for a 10-link kinematic chain is 45.
7. Rotary internal combustion engine is an inversion of Single slider crank chain.
8. When brakes are applied on a moving vehicle; the kinetic energy is converted to heat energy.
9. The included angle for the V-belt is usually $45^\circ - 60^\circ$.
10. In a Porter governor, the balls are attached to the extension of lower links.

II Write Short notes on ANY FIVE of the following

(5x2=10)

1. List out classification of governors.
2. Derive the condition for transmitting the maximum power in a flat belt drive.
3. Discuss briefly the various types of friction experienced by a body.
4. Explain the phenomena of 'slip' and 'creep' in a belt drive.
5. For the following gear and pinion specifications, calculate the reference diameter of gear and pinion in mm.
No. of teeth on gear = 32
No. of teeth on pinion = 16
Module = 8
6. Briefly explain about anti friction bearings.
7. Describe with a neat sketch the working of a single plate friction clutch.

III Answer ANY FIVE of the following.

(5x4=20)

1. Discuss on hunting of governor.
2. What is centrifugal tension in a belt? How does it affect the power transmitted?
3. What do you understand by the term 'interface' as applied to gears?
4. Explain the terms 'fluctuation of energy' and 'fluctuation of speed' as applied to flywheels.
5. In an epicyclic gear train, an arm carries two gears A and B having 36 and 45 teeth respectively. If the arm rotates at 150 r.p.m in the anticlockwise direction about the centre of the gear A which is fixed, determine the speed of gear B. If the gear A instead of being fixed makes 300 r.p.m in the clockwise direction, What will be the speed of gear B?
6. A horizontal cross compound steam engine develops 300 kW at 90 r.p.m The coefficient of fluctuation of energy as found from the turning moment diagram is to be 0.1 and the fluctuation of speed is to be kept within $\pm 0.5\%$ of the mean speed. Find the weight of the flywheel required, if the radius of gyration is 2 metres.

7. Four masses m_1 , m_2 , m_3 and m_4 are 200 kg, 300 kg, 240 kg and 260 kg respectively. The corresponding radii of rotation are 0.2 m, 0.15 m, 0.25 m and 0.3 m respectively and the angles between successive masses are 45° , 75° and 135° . Find the position and magnitude of the balance mass required, if its radius of rotation is 0.2 m.

IV Write an essay on ANY ONE of the following (1x10=10)

1. In a four bar chain ABCD, AD is fixed and is 150 mm long. The crank AB is 40 mm long and rotates at 120 r.p.m clockwise, while the link CD = 80 mm oscillates about D. BC and AD are of equal length. Find the angular velocity of link CD when angle BAD = 60° .
2. The arms of a Porter governor are each 250 mm long and pivoted on the governor axis. The mass of each ball is 5 kg and the mass of the central sleeve is 30 kg. The radius of rotation of the ball is 150 mm when the sleeve begins to rise and reaches a value of 200 mm for maximum speed. Determine the speed range of the governor. If the friction at the sleeve is equivalent of 20 N of load at the sleeve, determine how the speed range is modified.
