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B. TECH
(SEM IV) THEORY EXAMINATION 2018-19
THEORY OF MACHINE

Time: 3 Hours ***Total Marks: 100***

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. **2 x 10 = 20**

a. Define the lower pair and higher pair of common machine.
b. Differentiate between mechanism and machine.
c. Define the following for cam
   (i) Prime circle
   (ii) Pressure angle
d. What is slip and creep in a belt drive? Discuss the effect of slip.
e. What is the significance of degrees of freedom of a kinematic chain when it functions as a mechanism?
f. Explain the sensitiveness of governor
g. Explain the stability of governor
h. Define rubbing velocity of pin joint
i. What is centrifugal tension in a belt?
j. What is reverted gear train

SECTION B

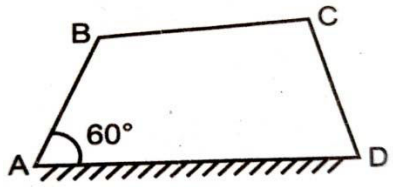
2. Attempt any *three* of the following: **10x3=30**

a. Enumerate the inversions of a double slider crank chain. Give examples.
b. A reverted gear train has a speed ratio of 12. The module pitch of gears A and B is 3.125 mm and that of gears C and D is 2.5 mm. The minimum number of gear teeth is 24. Calculate suitable number of teeth for gears.
c. Find an expression for the length of belt for cross belt drive.
d. A Porter governor has equal arms each 250 mm long and pivoted on the axis of rotation. Each ball has a mass of 5 kg and the mass of the central load on the sleeve is 25 kg. The radius of rotation of the ball is 150 mm when the governor begins to lift and 200 mm when the governor is at maximum speed. Find the minimum and maximum speeds and range of speed of the governor.
e. What is meant by static and dynamic balancing in machinery? How can the balance be done

SECTION C

3. Attempt any *one* part of the following:

a. Locate the instantaneous centre for a four bar link mechanism shown.AD =125mm , AB = 62.5 mm, BC= CD=75 mm. If the link AB rotates at a uniform speed of 10 rpm in the clockwise direction, find the angular velocity of the links BC and CD.



b. Explain different types of links; also explain different types of constraints.

4. Attempt any *one* part of the following:

a. Derive relation of velocity and acceleration of convex cam with flat faced follower.

b. A cam is to be designed for a knife edge follower with the following data:
1-Cam lift = 40 mm during 90° of cam rotation with simple harmonic motion.
2- Dwell for the next 30°.
3-during the next 60 ° of cam rotation, the follower returns to its original position with Simple harmonic motion.
4-Dwell during the remaining 180°,
Draw the profile of the cam when The line of stroke of the follower passes through the axis of the cam shafts

5. Attempt any *one* part of the following:

a. Derive the condition for transmitting the maximum power in a flat belt drive.

b. For a flat belt, prove that

$$\frac{T1}{T2} = e^{\mu\theta}$$, where

T1 = Tension in the tight side of the belt,
T2 = Tension in the slack side of the belt,
μ = Coefficient of friction between the belt and the pulley, and
θ = Angle of contact between the belt and the pulley (in radians

6. Attempt any *one* part of the following:

a. Describe with a neat sketch the working of a single plate friction clutch

b. Describe the function of a proell governor with neat sketch and prove that

$$N^2 = \frac{895}{h} \times \frac{a}{e}\left[\frac{m+M}{m}\right]$$

7. Attempt any *one* part of the following:

a. 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.

b. What is a flywheel? What is its use? Derive change in maximum fluctuation of energy

$\Delta E = 2EC_S$ or mv^2Cs or $mR^2\omega^2Cs$