Printed Pages: 2 **Sub Code: RME408**

Paper Id: 140269 **Roll No.** | | | | | | | | | | |

B TECH
(SEM IV) THEORY EXAMINATION 2018-19
THEORY OF MACHINES & MACHINE DESIGN

Time: 3 Hours ***Total Marks: 70***

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

SECTION A

1. Attempt *all* questions in brief. 2 x 7 = 14

a. Explain pitch point and pressure angle in cam-follower pair.

b. What do you mean by law of gearing?

c. Explain interference and list the methods to avoid interference.

d. Explain factor of safety and its importance.

e. What do you mean by anti-friction bearings?

f. What do you mean by fatigue and creep failure.

g. Explain effect of creep on power transmission through belt drive.

SECTION B

2. Attempt any *three* of the following: 7 x 3 = 21

a. Explain various inversions of single slider chain with suitable diagram.

b. A pair of involute gears have base circle diameters of 60 and 120 mm.
(a) If the center distance is 120 mm, what is the pressure angle?
(b) If the center distance is reduced to 100 mm, what is the pressure angle?
(c) What is the ratio of the two pitch diameters for each of the two center distances?

c. With the help of creep curve, explain different stages of creep.

d. It is required to design a cotter joint to connect two steel rods of equal diameter. Each rod is subjected to an axial tensile force of 50 kN. Design the joint and specify its dimensions. Assume plane carbon steel of grade 30C8 (S_{yt} = 400 N/mm^2) as the materials of two rods and cotter.

e. Find the power transmitted by a belt running over a pulley of 600 mm diameter at 200 r.p.m. The coefficient of friction between the belt and the pulley is 0.25, angle of lap 160° and maximum tension in the belt is 2500 N.

SECTION C

3. Attempt any *one* part of the following: 7 x 1 = 7

(a) What do you mean by design? Explain different phases of design in brief.

(b) What do you mean by kinematic pair? Classify and explain them with suitable diagram.

4. Attempt any *one* part of the following: 7 x 1 = 7

(a) Explain involute and cycloidal profile of teeth of gears and compare them.

(b) What do you mean by gear train? Explain different types of gear trains with the help of suitable diagram.

5. Attempt any *one* part of the following: 7 x 1 = 7

(a) What do you mean by theories of failure? Explain its importance and any one theory of failure.

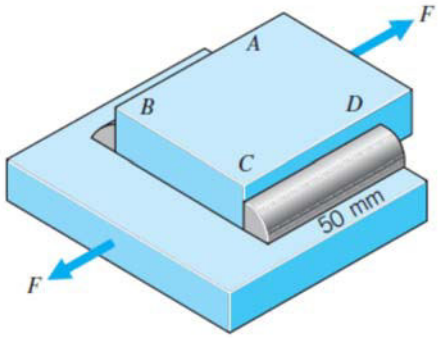
(b) Explain the procedure of design of cotter joint.

6. Attempt any *one* part of the following: 7 x 1 = 7

(a) The plates in Figure are 12 mm thick and made of steel having *Sy*= 350 MPa. They are welded together by convex fillet welds along sides *AB* and *CD*, each of whichis 50 mm long. Yield strength of the weld metal is 350 MPa. With a safety factor of 3(based on yield strength), what static load *F* can be carried using a 6-mm weld leg?

www.aktuonline.com

http://www.aktuonline.com



(b) A cam with 25 mm minimum radius is rotating counter-clockwise at 900 rpm to give the following motion to a knife edged follower:

Lift = 30 mm

Follower rises during 150^0 cam rotation with simple harmonic motion

Follower to dwell for 30^0 cam rotation

Follower to return during 90^0 rotations with constant velocity

Follower to dwell for remaining period

Draw cam profile.

7. Attempt any *one* part of the following: 7 x 1 = 7

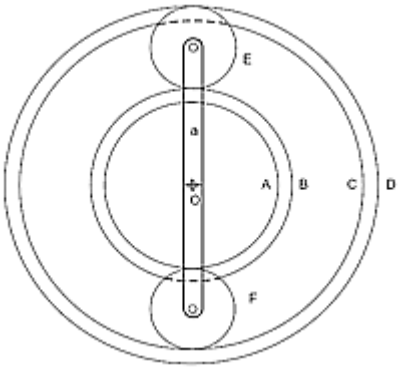
(a) In the epicyclic gear train shown in Figure the compound wheels A and B as well as internal wheels C and D rotate independently about the axis O. The wheels E and F rotate on the pins fixed to arm a. All the wheels are of the same module. The number of teeth on the wheels are

$T_A = 52$, $T_B = 56$, $T_E = T_F = 36$

Determine the speed of *C* if

(i) the wheel *D* fixed and arm *a* rotates at 200 rpm clockwise

(ii) the wheel *D* rotates at 200 rpm counter-clockwise and the arm *a* rotates at 20 rpm counter-clockwise



(b) A loaded governor of the Porter type has equal arms of 250 mm long .The mass of each ball is 2Kg. When the ball radius is 150 mm, the valve is fully open and when the ball radius is 185 mm, the valve is fully closed. Find the maximum speed and the range of speed .If the maximum speed is to be increased 20 % by an addition of mass to the central load, find what additional mass is required ?

www.aktuonline.com

http://www.aktuonline.com