

B.Tech. SEM -V Mechanical 2014 Course (CBCS) : SUMMER - 2019
SUBJECT : THEORY OF MACHINES

Day : Saturday
Date : 11/05/2019

S-2019-2686

Time : 10.00 AM TO 01.00 PM
Max. Marks : 60

N. B. :

- 1) All questions are **COMPULSORY**.
 - 2) Figures to the right indicate **FULL** marks.
 - 3) Draw neat and labeled diagram **WHEREVER** necessary.
 - 4) Assume suitable data, if necessary.
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Q. 1 The mating gears with module of 6.5 mm have 19 and 47 teeth of 20° pressure angle and standard addenda and dedenda. Determine the number of pairs of teeth in contact and angle turned through by the larger gear for one pair of teeth in contact. Determine also the ratio of the sliding velocity to the rolling velocity at the instant when the engagement commences, engagement terminates and at the pitch point. **(10)**

OR

Two mating gear have 20° involute teeth. The number of teeth on pinion is 24 and on gear wheel is 48. The speed of pinion on 300 rpm. The module 6 mm. If the addendum of each gear is such that the path of approach and path of recesses are half their maximum possible values. **(10)**

Find:

- i) The addendum of gears
- ii) The length of arc of contact
- iii) The maximum velocity of sliding of gears
- iv) The contact ratio

Q. 2 The centre distance between the two shafts, which are connected by two left handed helical gears is 37 cm. The shaft angle is 60° and normal module is 6 mm. If the gear ratio is 2 and larger gear is having 70 teeth, then find the helix angles of the two gears. **(10)**

OR

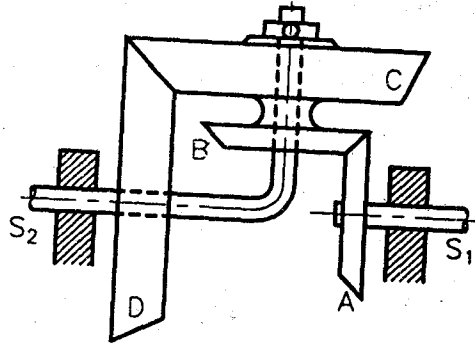
Derive the relation for efficiency of spiral gears and condition for maximum efficiency from first principle. **(10)**

Q. 3 An epicyclic train is composed of a fixed annular wheel 'A' having 150 teeth. Meshing with 'A' is a wheel 'B', which drives wheel 'D' through on idle wheel 'C', D being concentric with A. Wheels B and C are carried on an arm which revolves clockwise at 100 rpm about the axis of A and D. If the wheel B and D have 25 teeth and 40 teeth respectively. Find the number of teeth on C and speed and sense of rotation of 'C'. **(10)**

OR

In an epicyclic gear is shown in fig. the wheel A fixed to S_1 has 30 teeth and rotates at 500 rpm. B gears with A and is fixed rigidly to C, both being free to rotate on S_2 . The wheels B, C and D have 50, 70 and 90 teeth respectively. If D rotates at 120 rpm in a direction opposite to that of A. Find the speed of the shaft S_2 . **(10)**

P. T. O.



- Q. 4 A cone clutch having 30° cone angles is required to transmit 25 kW at 2000 rpm. The width of face is $1/3^{rd}$ of mean radius. The coefficient of friction is 0.20 and the pressure is limited to 3 bars. Assuming uniform wear condition. Find the axial load and the main dimensions of the clutch. (10)

OR

Explain with neat sketch working of the internal expanding shoe brake. Derive the relation between operating force and braking torque. (10)

- Q. 5 A circular arc cam with convex flanks operates on a flat faced follower which is a reciprocating one and line of reciprocation passes through the axis of rotation of the cam. The lift of the follower is 19 mm while radius of base circle of the cam is 38 mm. The nose radius is 10 mm. The cam is symmetrical about a line drawn through the centre of curvature of nose and centre of camshaft. If the total angle of action is 120° , determine radius of the flank. Determine maximum velocity, maximum acceleration and maximum retardation of the follower when the camshaft rotates at 500 rpm. (10)

OR

The following particulars rotate to the cam which is operating an oscillating knife-edge follower: (10)

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|------|--|---------------|
| i) | Base circle radius | = 30 mm |
| ii) | Distance between pivot of the lever and the knife-edge point | = 40 mm |
| iii) | Distance between the pivot and the cam centre | = 55 mm |
| iv) | Total angle of oscillation for the follower | = 28° |
| v) | Angle of ascent | = 75° |
| vi) | Angle of outer dwell | = 60° |
| vii) | Angle of descent | = 105° |

Draw the cam profile if ascent and descent, both takes place with S.H.M.

- Q. 6 Find the angle of inclination with respect to the vertical of a two wheeler negotiating a turn. (10)

Given: Combined mass of the vehicle with its rider 250 kg; mass moment of inertia of the engine fly wheel 0.3 kg-m^2 , mass moment of inertia of each road wheels 1 kg-m^2 , speed of engine flywheel 5 times that of road wheels and in the same direction; height of centre of gravity of rider with vehicle 0.6 m; two wheeler speed 90km/h; wheel radius 300 mm; radius of turn 50 m.

OR

Explain the construction and working of Centrifugal governor with suitable sketch. (10)

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