UNIVERSITY OF PUNE

[4363-113]

T.E.(Mechanical / Automobile) Examination May 2013

Theory of Machines-II

(2008 pattern)

Time-Three hours **Maximum Marks-100**

[Total No. of Question=12] **[Total no. of printed pages= 7]**

Instructions:

(1)Answer 3 questions from section I and 3 questions from section II.

(2)Answer to the TWO sections should be written in separate answer books

(3)Neat diagrams must be drawn whenever necessary.

(4)Figures to the right indicate full marks.

(5)Use of logarithmic tables slide rule,Mollier charts,electronic pocket calculator and steam tables is allowed.

(6)Assume suitable data whenever necessary.

SECTION-I

Q.1 (a)Explain Friction in turning pair. (4)

(b)Derive an expression for frictional torque of a collar thrust bearing assuming uniform pressure & uniform wear theory. (6)

(c)A single plate clutch,effective on both sides,is required to transmit 25 KW at 3000 r.p.m..Determine the outer and inner radii of frictional surface if the coefficient of friction is 0.225,the ratio of radii is 1.25 and the maximum pressure is not to be exceed $0.1\times10^{6}N/m^{2}$ .Also determine the axial thrust to be provided by springs. Assume uniform wear theory. (8)

OR

Q.2 (a)Write s short note on Epicyclic train Dynamometer. (6)

(b)Explain Multiple clutch with the help of neat sketch. (4)

(c)A differential band brake,as shown in fig.01 has an angle of contact of 225^0 .The band has compressed woven lining and bears against a cast iron drum of 350 diameter. The brake is to sustain a torque of 350 N-m and the coefficient of friction between the band and the drum is 0.30,find the necessary force for clockwise rotation of the drum. (8)

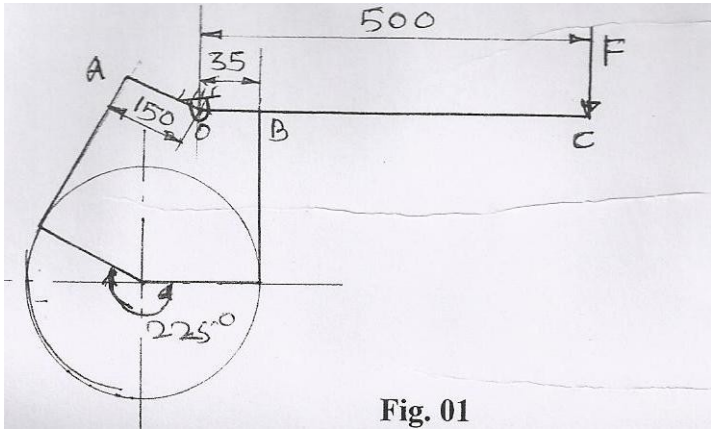

Fig. 01

Q.3 (a)Draw the profile of a cam ,offset 20mm to the right of the centre of the cam shaft.The base circle diameter is 75 mm and the diameter of the roller is 10mm.The follower is to move outward a distance 40mm with S.H.M. In 140^0 of the cam rotation to dwell for 40^0 of cam rotation to move inward with 150^0 of cam rotation with uniform acceleration and retardation ,acceleration being 2/3 of retardation.Calculate the maximum velocity and acceleration of the follower during outstroke if the camshaft rotates at 90 rpm. (16)

OR

Q.4 (a)Write a short note on cam jump phenomenon. (4)

(b)What do you mean by advanced can curves?Explain. (4)

(c)Derive expressions for displacement ,velocity and acceleration for circular arc cam operating a flat faced follower:(i)When the contact is on the circular flank. (8)

Q.5 (a)Write a short note on -(i)Hunting of governor and (ii)Governor effort & Governor power. (8)

(b)Derive from the first principles an expression of the gyroscopic couple. (8)

OR

Q.6 (a)A porter governor has all the four arms of 300 mm each. All the upper arms as well as the sleeve arms are pivoted on the axis of rotation. The mass of each governor ball is 1 Kg. The mass on sleeve is 20Kg find the speed of rotation when the ball rotates at a radius of 150mm. (8)

(b)A ship is pitching a total angle of 15^0 ,the oscillation may be taken as simple harmonic and the complete period is 32 seconds. The turbine rotor mass is 600Kg,its radius of gyration is 450mm and it is rotating at 2400 r.p.m.Calculate the maximum value of gyroscopic couple set by the rotor and its effect,when the bow is descending and the color is rotating clockwise looking from aft. What is the maximum angular acceleration to which the ship is subjected to while pitching? (8)

SECTION-II

Q.7 (a)Explain 'Conjugate action' in gearing. How involute profile satisfies the law of gearing? (8)

(b)Two 20^0 involute gears in mesh have a gear ratio of 2 and 20 teeth on the pinion. The module is 5mm and the pitch line speed is 1.5 m/s. assuming addendum to be equal to one module,find

(i)Angle turned by pinion when one pair of teeth is in mesh,and

(ii)Maximum velocity of sliding. (10)

OR

Q.8 (a)Explain the following term with reference to interference in the gears. (4)

(i)Rack shift (ii)Fouling

(b)Compare the cycloidal and involve gear tooth profile. (4)

(c)Following data relate to two meshing involute gears.

1.Number of teeth on the gear wheel=60

2.Pressure angle= 20^0

3.Gear ratio=1.5

4.Speed of the gear wheel=100rpm

5.Module=8mm

The addendum on each wheel is such that the path of approach and the path of recess on each side are 40 % of the maximum possible length each.Determine the addendum for the pioion and the gear and the length of arc of contact. (10)

Q.9 (a)A pair of single gear is required to give a speed reduction of 4:2:1.the gears are to have a normal module of 3mm, a pressure angle of 20^0 and a helix angle of 30^0 .If the shaft cetre lines are to be approximately 400mm apart ,determine the number of teeth on each wheel and exact centre distance.(8)

(b)Two spiral gears in mesh have the following data.

1.Angle of friction= 6^0

2.Normal pitch=20mm

3.Shaft angle= 55^0

4.Speed ratio=3

5.Approximate centre distance =400mm

6.Spiral angle of pinion= 25^0

Determine (i)exact centre distance (ii)number of teeth in each wheel, and (ii)efficiency of the drive. (8)

OR

Q.10 (a)A three start worm has pitch diameter of 80mm and a pitch of 20mm.It rotates at 600 rpm and drives a 40 tooth worm gear.If coefficient of friction is 0.05 , find

1.The helix angle of the worm

2.The speed of the gear

3.The centre distance

4.The efficiency and maximum efficiency. (10)

(b)Show various forces acting on the tooth of bevel gear. (6)

Q.11 (a)Explain the working principle of the following:(i)Reverted gears, (ii)Humpage gear. (6)

(b)The pitch circle diameter of annular gear in the epicyclic gear train shown in Fig.1 is 425 mm and the module is 5mm.When the annular gear 3 is stationary ,the spindle A makes one revolutions in the same sense as the sun gear 1 for every 6 revolutions of the driving spindle carrying the sun gear. All the planet gears are of the same size. Determine the number of teeth on all the gears. (10)

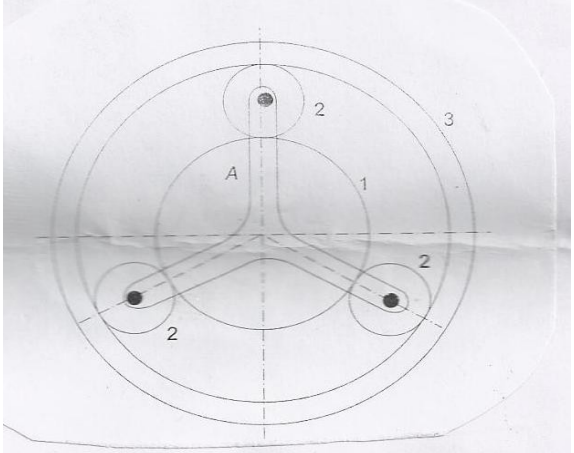

Fig. 1

OR

Q.12 In the gear drive shown in the fig 2.,the driving shaft A rotates at 300rpm in the clock wise direction,when seen from the left hand side. The shaft B is the driven shaft. The casing C is held stationary. The wheels E and H are keyed to the central vertical spindle and wheel F can rotate freely on this spindle. The wheels K and L are rigidly fixed to each other and rotate together freely on a pin fitted on the underside of F. The wheel L meshes with internal teeth on the casing C. The number of teeth on the different gears is indicated within the bracket.

Determine the number of teeth on gear C and speed and direction of rotation of shaft B. (16)

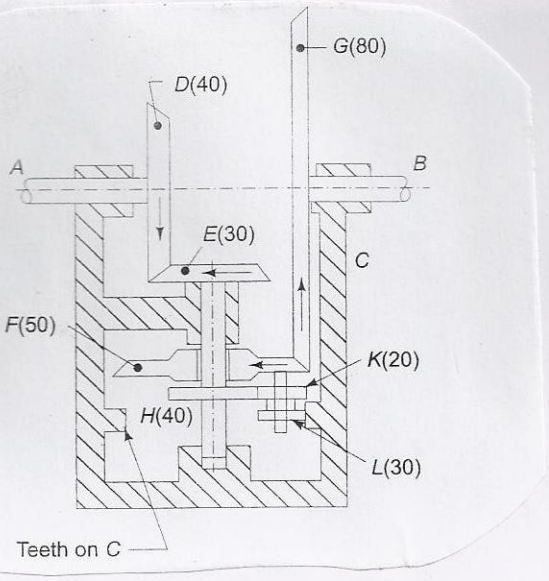

Fig.2