Roll No. | | | | | | | | | | | | | Total No. of Pages : 03

Total No. of Questions : 09

B.Tech.(AE/ME)/(IE) (2008 Batch) (Sem.–4)

THEORY OF MACHINES – II

Subject Code : ME-204

Paper ID : [A0809]

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. Write briefly :

(a) Write equations of equilibrium of a system.

(b) What is point of concurrency?

(c) Define couple.

(d) Explain equivalent offset inertia force.

(e) Why is balancing of machines necessary?

(f) What are the main advantages of double helical gear over single helical gear?

(g) What is the application of worm gear?

(h) Explain application of right hand screw rule as applicable to gyroscope.

(i) Explain number synthesis.

(j) Explain swaying couple.

SECTION-B

2. Determine the couple T_2 as applied in **Fig. 1**.

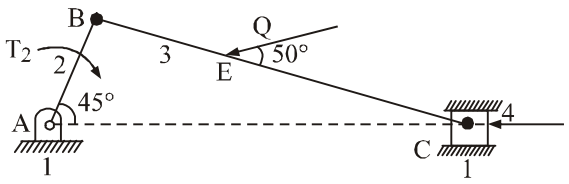

Fig.1

F = 4000 N, Q = 500 N, AB = 30 cm, BC = 45.5 cm and BE = 17.5 cm

3. Find the inertia forces for the following data of an I.C. engine :

Bore = 175 mm, stroke = 200 mm, engine speed = 500 rpm, length of connecting rod = 400 mm, crank angle is 60º from TDC and mass of reciprocating parts 180 kg.

4. The cam shaft of high speed pump consists of a parallel shaft 2.5 cm diameter and 48 cm long carries three eccentrics, each of diameter 6.0 cm and a uniform thickness of 1.8 cm. The assembly is symmetrical as shown in **Fig. 2** and bearings are at A and B. The angle between the eccentrics is 120º and eccentricity of each is 1.25 cm. The material weights 0.007 kg/cm^3 and speed of rotation is 1430 *r.p.m.* Find dynamic load on each bearing due to out of balance couple.

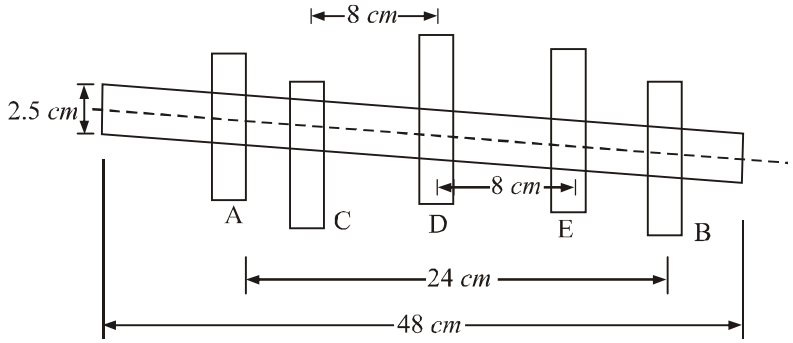

Fig.2

5. Two spiral gear wheels of diameter ratio 1.5 are used on a machine tool. The angle between shafts is 76º and the approximate centre distance is 11.5 cm. Speed of A is 1.5 times the speed of B and normal pitch is 1 cm. Find the number of teeth on each wheel and spiral angle for each wheel.

6. An epicyclic gear train consists of a sun wheel S, a stationary internal gear E and three identical planet wheel P carried on a star shaped planet carrier C. The size of different tooth wheels is such that the planet carrier C rotates at $1/5^{th}$ of the speed of the sun wheel S. The minimum number of teeth on any wheel is 16. Find number of teeth on different wheels.

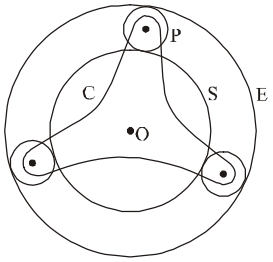

Fig.3

SECTION-C

7. Find the angle of inclination with respect to the vertical of a two wheeler negotiating a turn. Combined mass of the vehicle with rider is 250 kg. Moment of inertia of the engine flywheel 0.30 kg-m^2, M.I. of each road wheel 1 kg-m^2, speed of the engine flywheel 5 times that of road wheels and in the same direction; height of C.G. of rider with vehicle 0.60 m, two wheeler speed 90 km/hr, wheel radius 0.30 m and radius of turn 50 m.

8. For the four bar linkage, the following data are given :

   $\theta_2 = 60^o$, $\theta_4 = 90^o$

   $\omega_2 = 3$ rad/s, $\alpha_2 = -1$ rad/s^2

   $\omega_4 = 2$ rad/s, $\alpha_4 = 0$

   Determine the link – length ratios.

9. A vertical single cylinder engine is shown in **Fig. 4**. The lower piston is connected to the centre crank. The stroke is 80 mm for the lower piston. The upper piston operates the two outer cranks which are at 180^o to the centre crank. The reciprocating parts for the lower piston weigh 10 kg. The reciprocating parts for the upper piston weigh 20 kg. Find the stroke of the upper piston when the primary force is balanced.

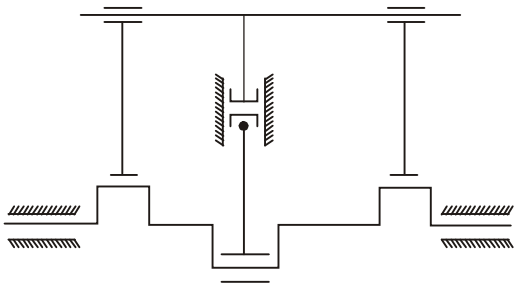

Fig.4