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Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (AE/ME) (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 the condition of equilibrium for a two force system.
- b) Describe the need for balancing of rotating parts.
- c) Write the disadvantage of helical gear over spur gear.
- d) Explain backlash in gears.
- e) Write the gear train used in differential gear and why?
- f) Define velocity ratio in context to gear train.
- g) Explain kinematic synthesis term.
- h) On what basis, is the minimum number of teeth on a gear determined?
- i) Describe primary balancing of reciprocating.
- j) Differentiate between working and total depth of gear.

SECTION-B

2. Derive the essential condition of placing the two masses so that the system becomes dynamical equivalent.
3. Describe effect of gyroscopic couple on a naval ship during pitching in detail.

4. Write the classification of kinematic synthesis problem. Explain each of them in detail.
5. An epicyclic gear consists of three gears A, B and C as shown in **Fig. 1**. The gear A has 72 internal teeth and gear C has 32 external teeth. The gear B meshes with both A and C and is carried on an arm EF which rotates about the centre of A at 18 rpm. If the gear A is fixed, determine the speed of gears B and C.

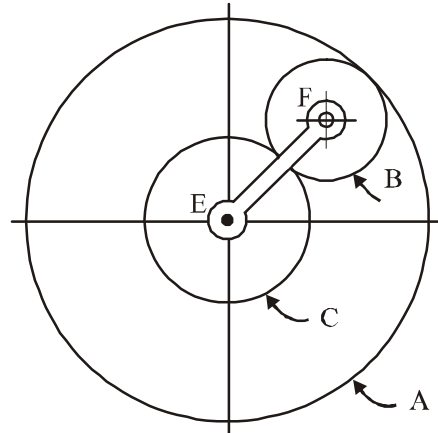


Fig.1

6. In a spiral gear drive connecting two shafts, the approximate centre distance is 400 mm and the speed ratio = 3. The angle between the two shafts is 50° and the normal pitch is 18 mm. The spiral angles for the driving and driven wheels are equal. Find : (a) Number of teeth on each wheel, (b) Exact centre distance, and c. Efficiency of the drive, if friction angle = 6° .

SECTION-C

7. A vertical petrol engine 100 mm diameter and 120 mm stroke has a connecting rod 250 mm long. The mass of the piston is 1.1 kg. The speed is 2000 rpm. On the expansion stroke with a crank 20° from top dead centre, the gas pressure is 700 kPa Determine : (a) Net force on the piston, (b) Resultant load on the gudgeon pin, (c) Thrust on the cylinder walls, and (d) Speed above which, other things remaining same, the gudgeon pin load would be reversed in direction.
8. Determine the proportions of four bar mechanism, by using three precision points, to generate $y = x^{1.5}$, where x varies between 1 and 4. Assume $\theta_s = 30^\circ$; $\Delta\theta = 90^\circ$; $\phi_s = 90^\circ$; and $\Delta\phi = 90^\circ$. Take length of the fixed link AD as 25 mm.
9. A four crank engine has the two outer cranks set at 120° to each other, and their reciprocating masses are each 400 kg. The distance between the planes of rotation of adjacent cranks are 450 mm, 750 mm and 600 mm. If the engine is to be in complete primary balance, find the reciprocating mass and the relative angular position for each of the inner cranks. If the length of each crank is 300 mm, the length of each connecting rod is 1.2 m and the speed of rotation is 240 rpm, what is the maximum secondary unbalanced force?