1. Two gear wheels mesh externally to give a velocity ratio of 3 to 1. The involute teeth has 6 mm module and 20° pressure angle. Addendum is equal to one module. The pinion rotates at 90 rpm. Determine

Number of teeth on pinion to avoid interference and the corresponding number on the wheel; (4)

The length of path and are of contact .Contact ratio and .The maximum velocity of sliding.

2. (i) Derive an expression to determine the length of path of contact between two spur gears of different size.

Briefly explain the sub—classification of compound gear trains with neat sketches.

3. (i) Explain the various pitches of helical gears with sketch. ii) Two 15 mm module 20° pressure angle spur gears have addendum equal to one module. The pinion has 25teeth and the gear 50 teeth. Determine whether interference will occur or not. If it occurs, to what valve should the pressure angle be changed to eliminate interference? (6)

4. An epicyclic gear train consists of three gears 1, 2 and 3 .the internal gear 1 has 72 teeth

and gear 3 has 32 teeth. The gear 2 meshes with both gear .1 and gear 3 and is carried on an arm A. which

rotates about the centre 02 at 20 rpm. If the gear 1 is fixed, determine the speed of gears 2 and 3

(ii) Write short notes on speed ratio of a planetary gear train. (4)

5. With the help of a neatly drawn sketch of a spur gear, explain elaborately the nomenclature of gears.

6. An epicyclic gear train is shown in Fig. 14(b). The input S has 24 teeth. Gears P and C constitute a

compound planet having 30 and 18 teeth respectively. If all the gears are of the same pitch, find the speed

ratio of the gear train assuming A to be fixed.

7. (i) State and prove the law of gearing. (10)

(ii) Show that the involute curves as the profiles of mating gears satisfy the law of gearing. (6)

8. A compound gear train using spur gears is required to give a total reduction ratio of 250 to 1 in four steps.

The modules of the gears are 5 mm for the first step, 7 mm for the second, 10 mm for the third and 16 mm for

the fourth.

Arrive at the individual speed ratios, if a tolerance of ±0.2% is

allowed in the total reduction ratio. (4)

Find the numbers of teeth of all gears, if the minimum number of teeth for any pinion is 20. (4)

Find the pitch circle diameters of all gears and the centre distances. (4)

Sketch a line diagram showing the gear train. (4)

9. (i) Two unequal gears of involute profile are to give required gear ratio. Derive an expression for the

minimum number of teeth required for the pinion in order to avoid interference. (12)

(ii) Two gear wheels mesh externally to give a velocity ratio of 3 to 1. The involute teeth have 6 mm module and 20° pressure angle. Addendum is equal to one module. Determine the number of teeth on pinion to avoid interference and the corresponding number on the wheel. (4)

10. A reverted compound gear train is used as back gear of a lathe. It is required to give a reduction from cone-pulley speed to spindle speed of approximately 9 to 1. The module of the teeth on the high-speed pair is 4 mm and of those on low-speed pair is 5 mm. The centre distance is 180 mm. Determine the number of teeth on each of the four wheels, if the pinions are to have as nearly as possible equal numbers of teeth. Also sketch a line diagram and show the gear train. (16)

11. A pinion of 20 involute teeth and 125 mm pitch circle diameter drives a rack. The addendum of both pinion and rack is 6.25 mm. What is the least pressure angle which can be used to avoid interference? With this pressure angle, find the length of the arc of contact and the minimum number of teeth in contact at a time.

12. In an epicyclic gear train shown in Fig.2, the pinion A has 15 teeth and is rigidly fixed in the motor shaft. The wheel B has 20 teeth and gears with A, and also with annular fixed wheel D. Pinion C has 15 teeth and is integral with B(C,B being a compound gear wheel). Gear C meshes with annular wheel E, which is keyed to the machine shaft. The arm rotates about the same shaft on which A is fixed and carries the compound wheel B—C. If the motor runs at 1000 rpm, find the speed of the machine shaft.

13. State the advantages of spur gear over helical gear. (3)

Which type of gear pair is to be used to get very large speed reduction in a single stage? State the reason.(3)

State and prove the fundamental law of gearing. (7)

Determine the minimum number of teeth to avoid interference in worst case of meshing with 14 2 ° pressure angle. (3)

14. Two mating gears have 20 and 40 involute teeth of module 10 mm and 20° pressure angle. The addendum on each wheel is to be made of such a length that the line of contact on each side of the pitch point has half the maximum possible length. Determine the addendum height for each gear wheel, length of the path of contact, arc of contact and contact ratio.

15. State and prove the law of gearing. (5)

In the epicyclic gear train shown in Fig, 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 is

TA = 52, TB= 56, TE= TF = 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.

(10)