

**B.TECH. SEM -V MECHANICAL 2014 COURSE (CBCS) :**

**SUMMER - 2018**

**SUBJECT: THEORY OF MACHINES**

**Day: Tuesday**  
**Date: 22/05/2018**

**S-2018-2366**

**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) Use of non-programmable **CALCULATOR** is allowed.
- 4) Draw neat and labeled diagrams **WHEREVER** necessary.

- Q.1** Two gears, wheels of diameters 90 mm and 30 mm have involute teeth of 6 mm module and  $20^\circ$  angle of obliquity. The addenda are equal and larger possible while avoiding interferences. Find: **(10)**
- i) The addendum
  - ii) The contact ratio
  - iii) The sliding velocity at start of contact if the pinion is driving at 2500 rpm.

**OR**

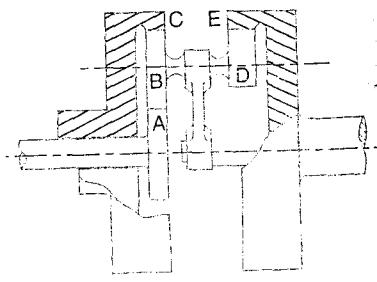
- Q.1** Two meshing gears have 40 and 60 involute teeth of module 10 mm and  $16^\circ$  pressure angle. The addendum of each wheel is to be made of such a length that the line of contact on each side of the pitch point has 60% of maximum possible length. Determine the addendum height for each gear wheel, length of path of contact, arc of contact and contact ratio. **(10)**

- Q.2** Two helical gears transmit 30 kw with velocity ratio 4, the normal pressure angle of  $20^\circ$  and helix angle  $25^\circ$ , normal module is 12 mm and standard addendum is equal to one module. The pinion has 20 teeth and rotates at 400 rpm. Determine the center distance and forces on tooth with neat sketch. **(10)**

**OR**

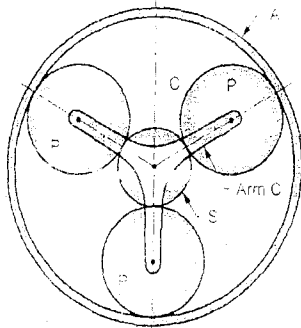
- Q.2** Two spiral gears of same hand having normal pitch of 14 mm drive a machine tool. The gears are of same size and their center distance is approximately 150 mm the angle between the shaft is  $70^\circ$  and speed ratio 2. Take friction angle  $8^\circ$ . Determine: **(10)**
- i) Spiral angle of each wheel
  - ii) Number of teeth on each wheel
  - iii) Efficiency of the drive
  - iv) Maximum efficiency

- Q.3** In the epicyclic gear train, as shown in Fig. The driving gear A rotating in clockwise direction has 14 teeth and the fixed annular gear C has 100 teeth. The ratio of teeth in gear E and D is 98:41. If 1.85 kw is supplied to the gear A rotating at 1200 rpm. Find: **(10)**
- i) The speed and direction of rotation of gear E
  - ii) The fixing torque required at C, assuming 100 per cent efficiency throughout and that all teeth have the same pitch.



OR

- Q.3** An epicyclic gear train shown in Fig has wheel S with 15 teeth fixed to a motor shaft running at 1450 rpm. The planet has 45 teeth and it gears with fixed annular wheel A and rotates on a spindle carried by an arm which is fixed to the output shaft P. Also gears with wheel S. Find the speed of the output shaft if the motor is transmitting 1.5 kw power. What is the torque exerted on the annular A. (10)



- Q.4** Explain construction and working of following dynamometers: (10)  
i) Prony brake dynamometer ii) Rope brake dynamometer

OR

- Q.4 a)** A single dry plate clutch transmits 7.5 kw at 900 rpm. The axial pressure is limited to  $0.07 \text{ N/mm}^2$ . If the coefficient of friction is 0.25 Find: (05)  
i) Mean radius and face width of the friction lining assuming the ratio of the mean radius to the face width is 4.  
ii) Outer and inner radii of the clutch plate.
- b)** Determine the maximum, minimum and average pressure in plate clutch when the axial force is 4 KN. The inside radius of the contact surface is 50 mm and the outside radius is 100 mm. Assume uniform wear. (05)

- Q.5** Write short notes on: (10)  
i) Advanced cam curves ii) Cam with specified counters  
iii) Cam jump phenomenon

OR

- Q.5** Draw the profile of a cam operating a roller reciprocating follower and with the following data, minimum radius of cam = 25 mm, Lift = 30 mm Roller diameter = 15 mm. The cam lifts the follower for  $120^\circ$  with SHM followed by a dwell period of  $30^\circ$ . Then the follower lowers down during  $150^\circ$  of the cam rotation with uniform acceleration and retardation followed by a dwell period. If the cam rotates at a uniform speed of 150 rpm. Calculate the maximum velocity and acceleration during the decent period (10)
- Q.6** An aero plane makes a half circle of 100 m radius towards left when flying at 400 Km/hr. The engine and propeller of plane weights 500 kg and has a radius of gyration of 30 cm. The engine rotates at 3000 rpm anticlockwise, when viewed from front end. Find the gyroscopic couple and its effect on aero plane with sketch. (10)

OR

- Q.6** Explain and derive equation of the effect of the gyroscopic couple on the reaction of the four wheels of a vehicle. (10)