



OR

- 6 a. Explain with neat sketches :  
 i) Compound gear train ii) Epicyclic train. (06 Marks)
- b. An internal wheel B with 80 teeth is keyed to a shaft F. A fixed internal wheel 'C' with 80 teeth is concentric with B. A compound wheel D-E gears with the two internal wheels, D has 28 teeth and gears with C while E gears with B. The compound wheels revolve freely on a pin which projects from a disc keyed to a shaft A co-axial with F. If all the wheels have the same pitch and shaft A makes 800 rpm, what is the speed of shaft F. (10 Marks)

**Module-4**

- 7 a. Explain balancing of rotating masses, where both the masses are on the same side. (06 Marks)
- b. A shaft carries four masses  $M_1$ ,  $M_2$ ,  $M_3$  and  $M_4$  attached to it. They all revolve in the same plane the magnitude of the masses are 6, 5, 9 and 7.5 kg respectively. The C.G of the masses are located at a radial distance of 100, 125, 150 and 75mm from the axis of the shaft. The angular positions of the masses are  $60^\circ$ ,  $135^\circ$  and  $270^\circ$  from  $M_1$ . Determine the position and magnitude of mass  $M_5$  and 250mm radius to balance the system. (10 Marks)

OR

- 8 a. State the conditions of balance in a multi-cylinder in line engine. (06 Marks)
- b. The following data are referred to a single cylinder engine speed = 250 rpm, stroke = 350mm. Mass of reciprocating parts = 60kg ; Mass of revolving parts at 175mm radius is 40kg. If  $\frac{2}{3}$ rd of reciprocating parts and all the revolving parts are to be balanced find.  
 i) Balancing mass required at 400mm radius  
 ii) Residual unbalanced force when the crank has rotated,  $60^\circ$  from T.D.C [Top dead centre or inner dead centre (IDC)]. (10 Marks)

**Module-5**

- 9 a. With a neat sketch, explain the working principle of a simple centrifugal governor. (06 Marks)
- b. A porter governor has all four arms 300mm long, the upper arms are pivoted on the axis of rotation and lower arm arc attached to the sleeve at a distance 35mm from axis. The mass of each ball is 7kg and the load on the sleeve is 540N. Determine the equilibrium speed for the two extreme radii of 200mm and 260mm of rotation of governor balls. (10 Marks)

OR

- 10 a. Sketch and explain controlling force, curves of porter governor. (06 Marks)
- b. The arms of a porter governor are each 300mm long and are hinged on the axis of rotation. The mass of each ball is 5kg. the radius of rotation of the ball is 200mm when the governor begins to lift and 250mm at the maximum speed. Determine the maximum and minimum speeds, if the mass of the sleeve is 15kg. Also find the range of speed if the frictional force at the sleeve is 30N. (10 Marks)

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