

Register No.: Name:

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FIRST SEMESTER M.TECH DEGREE EXAMINATION (Regular), FEBRUARY 2022**(MACHINE DESIGN)****(2021 Scheme)****Course Code : 21MD104-B****Course Name: Design of Power Transmission Elements****Max. Marks : 60****Duration: 3 Hours***Use of Design Data Book is Permitted***PART A***(Answer all questions. Each question carries 3 marks)*

1. What are the advantages and disadvantages of belt drives?
2. Describe a roller chain.
3. What is meant by backlash in gears?
4. What are the different ray diagrams? Explain any two.
5. Explain the working of a centrifugal clutch.
6. Write short notes on the friction materials used in clutch.
7. What do you mean by a self energizing brake?
8. What are the classifications of mechanical brakes?

PART B*(Answer one full question from each module, each question carries 6 marks)***MODULE I**

9. Design a belt drive to transmit 140 HP for a system consisting of 2 pulleys of diameter 90 cm and 120 cm. Centre distance of 350 cm, belt speed 20 m/s. Coefficient of friction 0.5, slip of 1.2 % at each pulley and 5 % friction loss at each shaft and 22 % overload. (6)

OR

10. Derive the expression for the length of open and crossed belt drives. (6)

MODULE II

11. Design a chain drive to actuate a machine from a 9 KW electric motor at 940 rpm. The machine speed is 320 rpm. Minimum center distance should be 0.55 m. Motor is mounted on an auxiliary bed. The machine is to work for 8 hours/day. (6)

OR

12. Explain the procedure for the design of chain drives. (6)

MODULE III

13. A pair of spur gears consists of a 20 teeth pinion meshing with a 120 teeth gear. The module is 4 mm. Calculate (6)
- (i) the centre distance;
 - (ii) the pitch circle diameters of the pinion and the gear;
 - (iii) the addendum and dedendum;
 - (iv) the tooth thickness;
 - (v) the bottom clearance; and
 - (vi) the gear ratio.

OR

14. Write short notes on gear lubrication. (6)

MODULE IV

15. Design a 4-speed gear box for a machine system. The speed should vary approximately from 210 to 460 rpm. The input shaft speed for the machine is 600 rpm. (6)

OR

16. Design a nine speed gear box for a milling machine with a minimum speed of 100 rpm and a maximum speed of 700 rpm. The motor speed is 1400 rpm. Determine the speed at which the input shaft is to be driven. (6)

MODULE V

17. The mean diameter of a cone clutch is 72 mm, the semi cone angle is 12.5 degree. Assuming coefficient of friction as 0.55, determine the minimum torque required to produce slipping of the clutch, for an axial force of 180 N. If the clutch is used to connect an electric motor with a stationary flywheel of an engine, how much time is required to attain the full speed. How much energy will be lost during slipping. Motor speed is 960 rpm and MI of flywheel is 0.5 Kgm². (6)

OR

18. A centrifugal clutch is to be designed to transmit 20 KW at 920 rpm. The shoes are four in number. The speed at which the engagement begins is 2/3rd of the running speed. The inside radius of the pulley rim is 150 mm. The shoes are lined with asbestos for which the COF may be taken as 0.45. Determine (6)
- (i) mass of the shoe
 - (ii) size of the shoes

MODULE VI

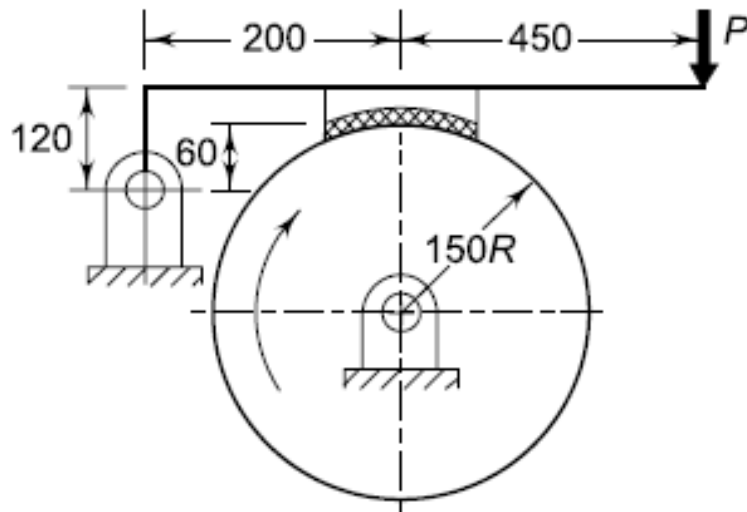
19. Write short notes on internal expanding brakes. (6)

OR

20. A single block brake with a torque capacity of 15 N-m is shown below. The coefficient of friction is 0.3 and the maximum pressure on the brake lining is 1 N/mm². The width of the block is equal to its length.

Calculate

- (i) the actuating force;
- (ii) the dimensions of the block;
- (iii) the resultant hinge-pin reaction; and
- (iv) the rate of heat generated, if the brake drum rotates at 50 rpm.



(6)
