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Question Paper Code: 36701

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2019

Sixth Semester

Mechanical Engineering

01UME601 - DESIGN OF TRANSMISSION SYSTEMS

(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1. What are the different types of belts and their material used for power transmission?
2. What are the advantages of a wire rope over fibre rope?
3. State the law of gearing.
4. State the two important modes of failure in gears.
5. What is a miter gear?
6. Sketch neatly the working drawing of bevel gears in mesh.
7. What are the speeds in a machine tool gear box in geometric series?
8. Distinguish between structural diagram and speed diagram.
9. Classify dry and wet clutches.
10. What is a self-energizing brake? When a brake becomes self-locking?

PART - B (5 x 16 = 80 Marks)

11. (a) Design a V-Belt drive for the following data: P = 22.5 *kW*; Speed ratio = 3; Driver speed = 740 *rpm*. (16)

Or

(b) Two shafts whose centres are 1 metre apart are connected by a V-belt drive. Thedriving pulley is supplied with 95 kW power and has an effective diameter of 300 mm. It runs at 1000 r.p.m. while the driven pulley runs at 375 r.p.m. The angle of groove on the pulleys is 40°. Permissible tension in 400 mm^2cross-sectional area belt is 2.1 MPa. The material of the belt has density of 1100 kg / m^3. The driven pulley is overhung, the distance of the centre from the nearest bearing being 200 mm. The coefficient of friction between belt and pulley rim is 0.28. Estimate: 1. The number of belts required; and 2. Diameter of driven pulley shaft, if permissible shear stress is 42 MPa. (16)

12. (a) An automotive gear box gives three forward speeds and one reverse with a top gear of unity and bottom and reverse gear ratio of approximately 3.3:1. The centre distance between the shafts is to be 110 mm approximately. Gear teeth of module 3.25 mm are to be employed. Sketch the layout of a typical constant mesh gear box for these conditions giving the number of teeth for the various gear wheels and showing closely how the different ratios are obtained. (16)

Or

(b) A pair of straight teeth spur gear is to transmit 22.5 *kW* when the pinion rotates at 300 *rpm*. The velocity ratio is 1:3. The allowable static stresses for the pinion and gear materials are 120 and 100 N/mm^2 respectively. The pinion has 15 teeth and face width is 14 times the module. Determine (i) the module (ii) face width and (iii) pitch circle diameters of both the pinion and the gear. (16)

13. (a) Design a pair of CI bevel gears for a special purpose machine tool transmit 3.5 *kW* from a shaft at 500 *rpm* to another at 800 *rpm*. The gears overhang in their shafts. Life required is 8000 *hours*. (16)

Or

(b) A triple threaded worm has teeth of 6 mm module and pitch circle diameter of 50 mm. If the worm gear has 30 teeth of 14½° and the coefficient of friction of the worm gearing is 0.05, find 1. the lead angle of the worm, 2. Velocity ratio, 3. centre distance, and 4. Efficiency of the worm gearing. (16)

14. (a) Design a 12 speed gear box for an all geared headstock of a lathe by drawing speed diagram. Show the details in a kinematic lay out. The maximum and minimum speeds are to be 1400 *rpm* and 112 *rpm* respectively. Take the input drive speed to be the 1400 *rpm*. (16)

Or

(b) A gear drive is required to transmit a maximum power of 22.5 kW. The velocity ratio is 1:2 and r.p.m. of the pinion is 200. The approximate centre distance between the shafts may be taken as 600 mm. The teeth have 20° stub involute profiles. The static stress for the gear material (which is cast iron) may be taken as 60 MPa and face width as 10 times the module. Find the module, face width and number of teeth on each gear. Check the design for dynamic and wear loads. The deformation or dynamic factor in the Buckingham equation may be taken as 80 and the material combination factor for the wear as 1.4. (16)

15. (a) A multiple disc wet clutch is to be designed for a machine tool driven by a electrical motor of 12.46 *kW* running at 1400 *rpm*. The space restrictions limit the outside disc diameter to 100 *mm*. Determine appropriate values for disc inside diameter, total number of discs and the clamping force. (16)

Or

(b) A single cylinder double acting steam engine delivers 185 kW at 100 r.p.m. The maximum fluctuation of energy per revolution is 15 per cent of the energy developed per revolution. The speed variation is limited to 1 per cent either way from the mean. The mean diameter of the rim is 2.4 m. Design and draw two views of the flywheel. (16)

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