PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

TEST - 1

Even Semester: 2018-19

Course Code: MEC216

Course Name: Design of Transmission Systems

Programme & Sem: B.Tech. & VIII Sem (Group-I)

Date: 01 March 2019

Time: 1 Hour 15 Mins

Max Marks: 40

Weightage: 20%

Instructions:
 (i)   Read the question properly and answer accordingly.
 (ii) Question paper consists of 3 parts.
 (iii) Scientific and Non-programmable calculators are permitted.
 (iv) Use of Design data hand book permitted.

Part A

Answer **both** the Questions. **Each** question carries **four** marks.   (2Qx4M=8)

1. Derive an expression for the ratio of tension in V-belt drive.
2. Derive an expression for the shear stress induced in a helical compression spring, with usual notations.

Part B

Answer **all** the Questions. **Each** question carries **ten** marks.   (2Qx10M=20)

3. A link of S-shape made of a 25 mm round steel bar is shown in Fig. 1. It is made of plain carbon steel 45C8 (σ_{yt} = 380 N/mm^2). Determine the maximum tensile, compressive and shear stress and find factor of safety.

Figure.1
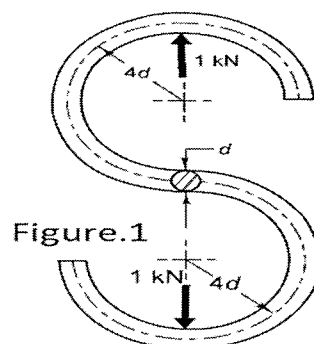
4. It is required to design a helical compression spring subjected to a maximum force of 1250 N. The deflection of the spring corresponding to the maximum force should be approximately 30 mm. The spring index can be taken as 6. The spring is made of Patented and cold-drawn steel wire. The modulus of rigidity of the spring material is 81 370 N/mm^2 respectively. The permissible shear stress for the spring wire should be taken as 545 N/mm^2. Design the helical compression spring.

Answer the Question. Question carries **twelve** marks. (1Qx12M=12)

5. The flat belt is required to transmit 10 kW from a pulley of 600 mm effective diameter running at 300 rpm. The angle of contact is spread over 7/16 of circumference. Determine the width of the belt whose thickness is 10 mm. The allowable stress for the belt is 2.25 N/mm^2. Coefficient of friction between pulley and belt is 0.3. Specific weight of belt material is 10x10^3 N/mm^2.

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TEST 2

Even Semester: 2018-19

Course Code: MEC 216

Course Name: Design of Transmission systems

Program & Sem: B.Tech & VIII Sem (Group-I)

Date: 13 April 2019

Time: 1 Hour 15 Minutes

Max Marks: 40

Weightage: 20%

Instructions:
(i) Read the question properly and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and Non-programmable calculators are permitted.
(iv) Design hand book is permitted

Part A

Answer the Questions. The Question carries **four** marks. (1Qx4M=04)

1. What are the reasons for dynamic tooth loads in gears?

Part B

Answer **both** the Questions. **Each** Question carries **fourteen** marks. (2Qx14M=28)

2. Design a pair of spur gears to transmit 20 kW from a shaft rotating at 1000 rpm to a Parallel shaft which is to rotate at 310 rpm. Assume number of teeth on pinion 31 and 20° full depth involute profile. The material for pinion is C40 steel Untreated and for gear Cast steel 0.20% C untreated.

3. A pair of helical gears is required to transmit 12 kW. The pinion runs at 1200 rpm and Velocity ratio is 3:1. The teeth are 20° FDI. Both pinion and gear are made of Cast steel 0.2% C heat treated (σ_d= 192.3 N/mm^2) .The wear and lubrication factor may be taken as 1.15 the helix angle is 45°, assume service factor 1.5 and number of teeth on pinion is 20 and value of dynamic factor as 457.8 Design the gears and check for the wear.

Part C

Answer the Question. The Question carries **eight** marks. (1Qx8M=8)

4. A semi-elliptic leaf spring used for automobile suspension consists of three extra full-length leaves and 15 graduated-length leaves, including the master leaf. The Centre-to-Centre distance between two eyes of the spring is 1 m. The maximum force that can act on the spring is 75 kN. For each leaf, the ratio of width to thickness is 9:1.The modulus of elasticity of the leaf material is 207 000 N/mm^2. The leaves are pre-stressed in such a way that when the force is maximum, the stresses induced in all leaves are same and equal to 450 N/mm^2.
Determine (i) the width and thickness of the leaves ; (ii) the initial nip; and (iii) the initial pre-load required to close the gap C between extra full-length leaves and graduated-length leaves.

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SUMMER TERM/MAKE UP END TERM EXAMINATION

Semester: Summer Term 2019 **Date**: 25 July 2019

Course Code: MEC 216 **Time**: 2 Hours

Course Name: Design of Transmission System **Max Marks**: 80

Program & Sem: B.Tech (MECH) & VIISem (2015 Batch) **Weightage**: 40%

Instructions:

- *(i)* *Read the questions properly and answer accordingly*
- *(ii)* *Question paper consists of 3 parts*
- *(iii)* *Scientific and Non programmable calculators, data books are permitted*

Part A

Answer **all** the Questions. **Each** question carries **one** marks. (20Qx1M=20M)

1. Match the following according to their uses (6M)

a.Spur gears	i. Used for connecting skew shafts
b.Bevel gears	ii. Used for connecting parallel shafts
c.Helical gears	iii. Used for connecting parallel shafts generating lesser noises
d.Worm gears	iv. Used for connecting shafts at an angle
e.Rack & pinion	v. Used for transforming rotary motion into linear motion
f.Mitre gears	vi. Used for connecting shafts at 90° to each other

2. Match the following according to the terminologies used in their design (6 M)

a. Belt drives	i. Module
b. Springs	ii. Inertial loads
c. Gears	iii. Nip
d. Leaf springs	iv. Tensions
e. Rope drives	v. Wahl's factor
f. Curved beams	vi. Neutral axis

3. Which is the most commonly used material for spring wires? (1M)
   a. Gray cast iron **b.** glass **c.** Patented & cold drawn wires **d.** All the above

4. What is the design criteria in worm gears ? (1M)
   a. heat generated > heat dissipated **b.** Heat dissipated > heat generated
   c. Pressure angle is small **d.** None of the above

5. What is the velocity ratios used in worm gears ? (1M)
   a. less than 5:1   **b.** around 5:1   **c.** more than 20:1   **d.** All the above

6. Define module for spur gears (1M)
   a. Diameter/ thickness   b. Thickness/Diameter
   c. Diameter/No.of teeth   d. No.of teeth/ Diameter

7. Fill in the blanks (4M)
   a. The assumptions in spur/helical/worm gears is that b= ___ m ; m= module b = face width
   b. The assumption in bevel gear is that b=___L ; L= slant height b = face width
   c. In curved beams, _____ (Inner/outer) fibre is considered for design?
   d. Equivalent number of teeth in helical gears is given by the formula Te = _____ ?

Part B

Answer **all** the Questions. **Each** question carries **five** marks.   (4Qx5M=20M)

8. Determine the module of a worm gear to transmit 18kW from a worm rotating at 1440 rpm to a worm when to rotate at 40 rpm. Select phosphor bronze(Strength = 103.5 MPa) for worm gear and a 20° full depth involute system.

9. Design a single plate clutch to transmit 30kW at 1200 rpm. The outside diameter of the friction lining is 1.5 times the inside diameter. It is lined with asbestos having allowable pressure of 0.24 MPa and coefficient of friction 0.3. Use uniform pressure theory.

10. A single block brake is shown in the figure below. The diameter of the drum is 250mm and the angle of contact is 90°. If the operating force of 700 N is applied at the end of the lever and the coefficient of friction between the drum and the lining is 0.35, determine the torque that may be transmitted by the block brake


All dimensions in mm.
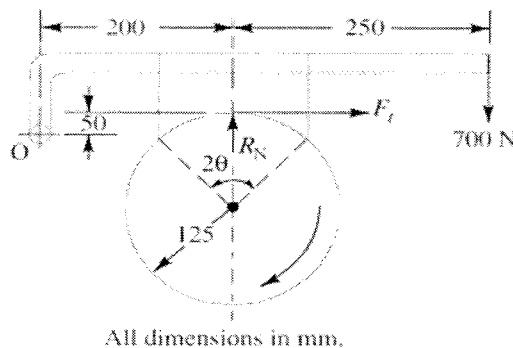
11. Define the following in the context of bearings:
    i) Hydrodynamic bearing ii) Dynamic load carrying capacity iii) Equivalent load carrying capacity
    iv) Hydrostatic bearing v) Static load carrying capacity

Answer **all** the Questions. **Each** question carries **ten** marks. (4Qx10M=40M)

12. A cone clutch with asbestos friction lining transmits 30 kW power at 500 rpm. The coefficient of friction is 0.2 and the permissible intensity of pressure is 0.35 N/mm2. The semi-cone angle α is 12.5°. The outer diameter is fixed as 300 mm from space limitations. Assuming uniform wear theory, calculate: (i) the inner diameter; (ii) the face width of the friction lining; and (iii) the force required to engage the clutch.

13. Design a pair of spur gears completely to transmit 20kW from a shaft rotating at 1000 rpm to a parallel shaft that rotates at 310 rpm. Assume number of teeth on pinion as 31 and 20° full depth involute system. The material for pinion & gear is C40 steel untreated and for gear it is cast steel 0.2% untreated.

14. A differential band brake is shown in Fig. below. The width and the thickness of the steel band are 100 mm and 3 mm respectively and the maximum tensile stress in the band is 50 N/mm2. The coefficient of friction between the friction lining and the brake drum is 0.25. Calculate:
(i) the tensions in the band;
(ii) the actuating force; and
(iii) the torque capacity of the brake. Also Find out whether the brake is self-locking.
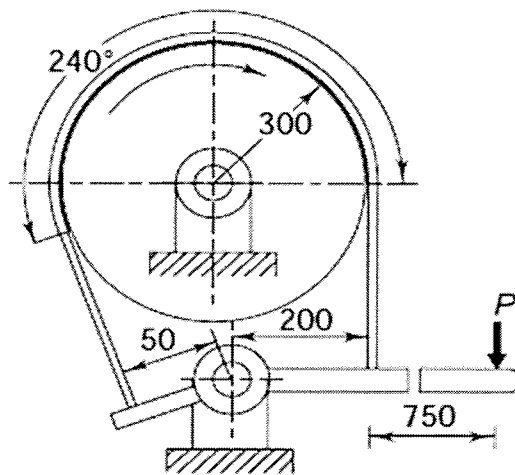
15. Two shafts inclined at 60 °are connected by a pair of bevel gears to transmit 9kW at 900 rpm of 24 tooth cast steel pinion. The gear is made of high grade CI and is to be run at 300 rpm. The teeth are 14.5 ° involute form. Find the module of the gears. Cast steel the allowable strength is 138 MPa and for Cast Iron the allowable strength is 103 MPa.