

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)



IV SEMESTER B.TECH (AUTOMOBILE ENGINEERING) END SEMESTER EXAMINATIONS, JUNE/JULY 2016

SUBJECT: DESIGN OF MACHINE ELEMENTS [AAE 2252]

REVISED CREDIT SYSTEM

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:

- ✤ Answer ALL the questions.
- Missing data if any may be suitable assumed and clearly mentioned.
- 1A. A reciprocating machine running at 360 rpm is driven by 12 kW, 1440 rpm (05) motor through a 14.5° involute spur gear. The center distance between the drive is 250 mm. Assume light shock at 8 hrs/day operation. Design the gear pair and calculate all the gear parameters. (01= 191.3 N/mm2, 02= 137.4 N/mm², K=2.9038)
- 1B. For the above designed gear pair, check for dynamic, static and wear safety. (05)Mention the remedial measures, in case of failure
- 2A. With neat sketches, briefly explain the classification of wire rope drives. (05) Mention the applications of rope drives, and justify its non-feasibility in today's era over wire rope drives.
- **2B.** Derive an equation for deflection of helical springs. (03)
- **2C.** Classify different types of rolling contact bearings. (02)
- 3A. A helical spring made from hard drawn spring wire having wire diameter of (05)
 6.3mm has an outside diameter of 57.3 mm with squared and ground ends with 12 coils. Determine: Spring rate and Free length of spring.
- **3B.** State the reason for graduated leaves and camber in leaf spring. (02)
- **3C.** Explain Hydrodynamic lubrication.

(03)

- 4A. Design a steel (= 50 MPa) helical gear pair from the following data: P= 30kW, (05) N1= 1500 rpm, i=4, z1= 24, =20° in diametral plane, = 30°, BHN=350. Also, calculate all the gear parameters.
- **4B.** For the above gear pair, check for safety based on strength and wear. **(05)**
- 5A. Derive Petroff's equation and hence deduce Somerfield Number. (03)
- 5B. A locomotive semi-elliptical laminated spring has an overall length of 1 m and (05) sustains a load of 70 kN at its center. The spring has 3 full length leaves and 15 graduated leaves with a central band of 100 mm width. All the leaves are to be stressed to 400 MPa, when fully loaded. The ratio of the total spring depth to that of width is 2. E = 210 kN/mm². Determine: The thickness and width of the leaves, the initial gap that should be provided between the full length and graduated leaves before the band load is applied and the load exerted on the band after the spring is assembled.
- **5C.** Mention the design procedure of a worm gear system. (02)