



Manipal Institute of Technology, Manipal



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(A Constituent Institute of Manipal University)

V SEMESTER B.TECH (I & P ENGG.)

END SEMESTER EXAMINATIONS, DEC 2015/JAN 2016 SUBJECT: DESIGN OF MACHINE ELEMENTS (MME - 317)

REVISED CREDIT SYSTEM

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:

- ✤ Answer ANY FIVE FULL the questions.
- ✤ Missing data may be suitable assumed.
- ✤ Use of design data hand book is permitted

1A.

Explain the procedure for design of machine elements with a flow chart

1B.

A flat bar shown in figure below is subjected to an axial load of 100kN. Assuming that the stress in the bar is limited to 200 N/m², determine the thickness of bar.



- 2A. A steel shaft 2 m long between bearings carries a 1200 N pulley at the midpoint. The pulley is keyed to the shaft and receives 20 KW at 150 rpm which is transmitted to the flexible coupling just outside the right bearing. The belt drive is horizontal. The ratio of belt tension is 3:1. The diameter of the pulley is 600 mm. assume C_m = C_t = 1.5. Calculate the necessary shaft size
- 2B. A rectangular sunk key, 14 mm wide, 10 mm thick & 75 mm long is required to transmit 1200 N-m torque from a 50 mm diameter solid shaft. Determine whether the length is sufficient or not if the permissible shear stress = 56 MPa and crushing stress = 168 MPa

2C.

What are the factors to be considered while selecting the types of key?

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3A.	What are the factors depends upon the selection of material for spring wire? What are the important spring materials	5
3B.	Show that the efficiency of self-locking screw is less than 50 $\%$	3
3C.	List the factors influencing the selection of suitable material for machine element	2
4A.	A reciprocating machine running at 360 rpm is driven by 12 KW, 1440 rpm motor at 14.5 ^o involute gear. The centre distance between the drive is 250 mm. the pinion is made of heat treated cast steel. Assume high shock condition and 8 hours per day operation. Calculate module and face width of spur gear for strength requirement only	5
4B.	A helical valve spring is to be designed for operating load range of 100 N – 150 N. 100 N where the valve is closed and 150 N when the valve is opened. The deflection of the spring in the above range is 7.5 mm. the spring index is 10. The permissible stress for material of the spring is 380 N/mm ² . determine (i) Number of active coils (ii) Diameter of wire and mean coil diameter	5
5A.	Derive an expression for torque required to raise and lower the load on square threaded screw	5
5B.	Explain the following theories of failure (i) Maximum shear stress theory (ii) Distortion energy theory	5
6A.	Explain the following (i) overhauling in power screws (ii) Hydrodynamic lubrication (iii) Bearing modulus	5
6B.	State the assumptions made and derive Lewis equation for spur gear	5