

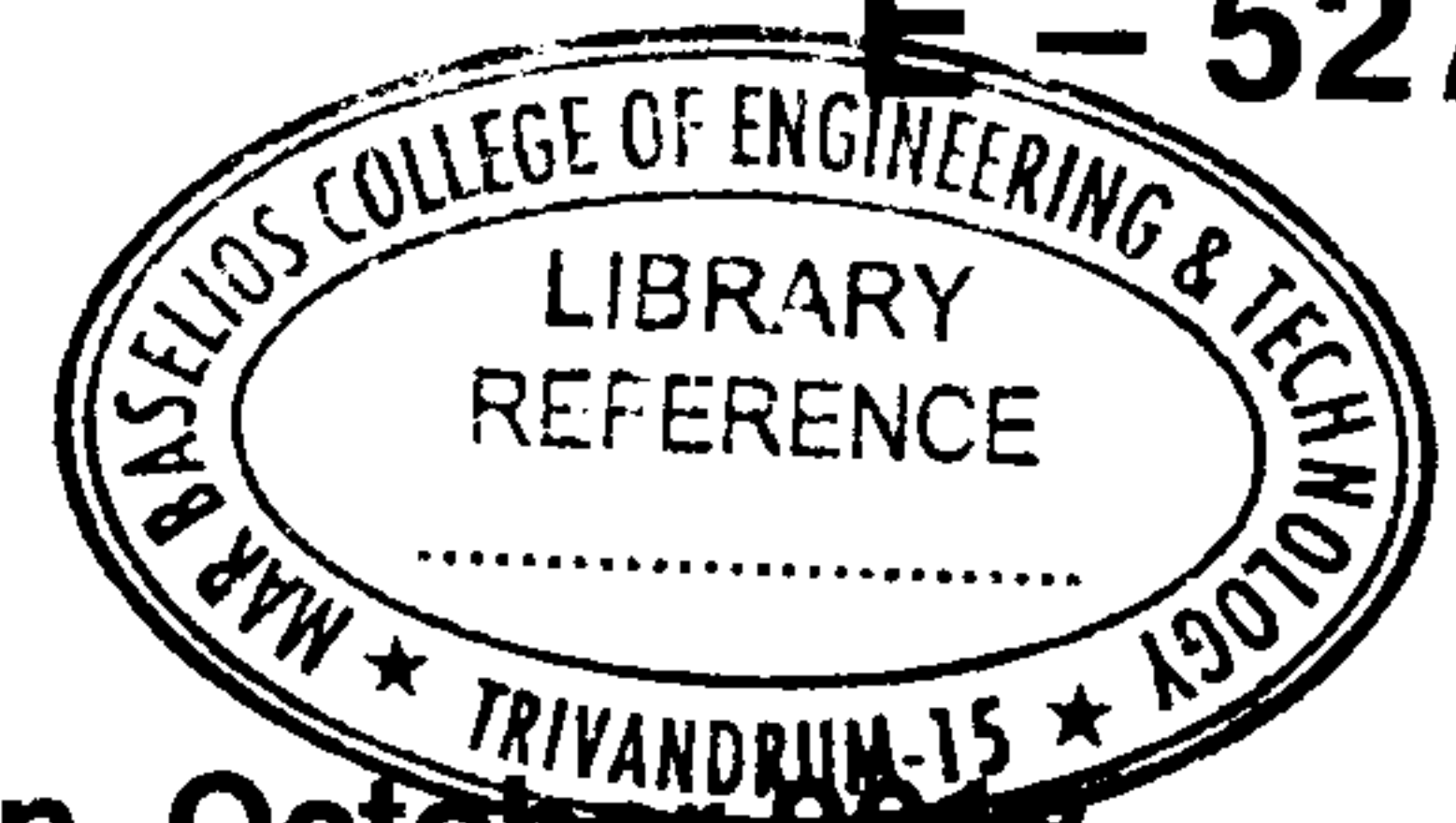


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Reg. No. : .....

Name : .....



**Seventh Semester B.Tech. Degree Examination, October 2018  
(2013 Scheme)**

**13.705 : DESIGN OF MACHINE ELEMENTS – II (M)**

Time : 3 Hours

Max. Marks : 100

- Instructions :**
- 1) Answer **all** questions from Part A. Each question carries 4 marks.
  - 2) Answer **one full** question from **each** Module in Part B. Each full question carries 20 marks.
  - 3) **Assume** any missing data suitably.
  - 4) **Use** of approved design data hand book is **permitted**.

**PART – A**

1. Derive an expression for beam strength of a gear teeth.
2. Explain the theory of hydrodynamic lubrication.
3. Enumerate the advantages and disadvantages of rolling contact bearing.
4. What are the causes of failure of crankshaft ?
5. Explain dilation of pressure vessel. **(5×4=20 Marks)**

**PART – B**

**Module – I**

6. A cast iron pinion having a diameter of about 0.20 m meshes with a steel gear which turns at one third the angular speed of the pinion. The pinion rotates at 1150 rpm and carries a torsional moment of 2000 Nm. Pressure angle is 20°. Design the spur gear set. **20**
7. A pair of 20° full depth involute tooth helical gear is to transmit 22 KW at a speed of 300 rpm of the pinion. Speed ratio is 1.4 and helix angle is 30°. The pinion is made of cast steel and the gear is made of cast iron. Design the pair. **20**

**Module – II**

8. Design a journal and bearing to support a load of 5000 N at 900 rpm using hardened steel journal and bronze-backed bearing. An abundance of oil is provided which has a specific gravity of 0.89 at 15.5° C and a viscosity of 11.2 centistokes at 80° C that may be taken to the limiting temperature for oil. Assume a clearance of 0.0025 cm per cm of diameter. Also calculate the mass of lubricating oil and rise in temperature. **20**

P.T.O.



9. Select a suitable bearing which is to operate at 1500 rpm and is acted upon by a 8 kN radial load and 5 kN thrust load. The inner ring rotates, the load is steady and continues. The shaft diameter from strength consideration is 45 mm and the life expectancy is 500 hrs. If the bearing outer ring is rotating and is subjected to light shock, how the life of the bearing changes ? 20

### Module – III

10. An otto cycle engine develops 60 KW indicated power at 150 rpm with 75 explosions per minute. The change of speed from the commencement to the end of power stroke must not exceed 0.5% of mean on either side. Design a suitable rim section having width four times the depth so that the hoop stress does not exceed  $3.925 \text{ MN/m}^2$ . Assume that the flywheel stores  $15/14$  times the energy stored by the rim and that the work done during power stroke is 1.4 times the work done during the cycle. Take density of rim material as  $7200 \text{ kg/m}^3$ . 20
11. Design a connecting rod for four stroke petrol engine with the following data: Diameter of piston = 8.8 cm, stroke = 12.5 cm, weight of reciprocating parts = 1.8 kg, length of connecting rod = 32 cm, R.P.M. = 3000, compression ratio = 6.8:1, Maximum explosion pressure =  $35 \text{ kg/cm}^2$ . 20

### Module – IV

12. a) Differentiate between thin and thick cylinders. 6
- b) A high pressure cylinder consists of a steel tube with inner and outer diameters of 20 and 40 mm respectively. It is jacketed by an outer steel tube having outer diameter of 60 mm. The tubes are assembled by a shrinkage process in such a way that maximum principal stress induced in any tube is limited to  $100 \text{ N/mm}^2$ . Calculate the shrinkage pressure and original dimensions of the tubes.  $E = 207 \text{ kN/mm}^2$ . 14
13. A centrifugal clutch transmitting 20 KW at 900 rpm consists of four shoes. The clutch is to be engaged at 500 rpm. The inner radius of the drum is 165 mm. The radius of the centre of gravity of the shoes is 140 mm, when the clutch is engaged. The coefficient of friction is 0.3, while the permissible pressure on friction lining is  $0.1 \text{ N/mm}^2$ . Calculate : 20
- i) the mass of each shoe and
  - ii) the dimensions of friction lining.
- (4×20=80 Marks)**