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Reg. No. : .....

Name : .....

Seventh Semester B.Tech. Degree Examination, October 2014
(2008 Scheme)
08.705 : DESIGN OF MACHINE ELEMENTS II (M)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **all** questions from Part – **A each** carries **4** marks and **one full** question from **each** Module of Part – **B each** carries **20** marks.*
*2) Assume any missing data **suitably**.*
*3) Use of approved Design Data Hand Book is **permitted**.*
*4) Make neat sketches **wherever** necessary.*

PART – A

1. State and explain the fundamental law of gearing.
2. In helical gears explain :
   i) Helix angle
   ii) Normal pitch
   iii) Axial pitch
   iv) Formative number of teeth
3. What are the advantages and disadvantages of stub teeth ?
4. Explain the terms : attitude, eccentricity, film thickness and viscosity.
5. Derive Petroff's equation to determine the coefficient of friction.
6. Explain the term : 'Elastohydrodynamic Bearings'.
7. Briefly explain the curve : Life of Bearings Vs Survival rate in %.
8. Explain the uses of piston rings in an I.C. Engine.
9. Briefly explain the reasons for using I-section for I.C. Engine connecting rods.
10. What are the assumptions made in the design of clutches ? **(10×4=40 Marks)**

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P.T.O.

PART – B

Module – 1

11. A pair of spur gears with 20° full depth involute teeth is to transmit 10 kW with a pinion speed of 1440 rpm. The speed reduction is 4:1. The pinion as well as the gear are made of plain carbon steel 40 C8 ($\sigma_u = 600$ N/mm^2). Design the gears, specify their dimension and check the gears for its wear strength. **20**

OR

12. A pair of cast iron bevel gears connect two shafts at right angles. The pitch diameter of the pinion is 80 mm and gear is 100 mm. The tooth profiles of the gears are of $14\frac{1}{2}^\circ$ composite form. The allowable static stress for both the gears is 55 MPa. If the pinion transmits 2.75 kW at 1100 rpm, find the dimensions of each gear based on strength, no of teeth on each gear and check the design for wear. Take surface endurance limit as 630 MPa and modulus of elasticity for cast iron as 84 kN/mm^2. **20**

Module – 2

13. Design a full journal bearing to support a load of 4.5 kN at 600 rpm. The oil used is light transmission oil. The journal diameter is 80 mm. Take room temperature as 21°C and the oil temperature as 80°C. Make proper assumptions wherever necessary and design the bearing for hydrodynamic condition, acceptable co-efficient of friction and heat balance. **20**

OR

14. A deep groove ball bearing (ISI : 75 BC 02) is to operate as detailed below.

Time	rpm	Radial Load in N	Axial Load in N
30%	500	6000 N	3000 N
55%	800	5000 N	2500 N
15%	1200	4000 N	3000 N

Assume smooth operation with a service factor of 1. Determine :

a) the cubic mean load

b) the 90% life of the bearing in hours

c) the average life in hours

d) the median life in hours. **20**

Module – 3

15. Design a connecting rod for a petrol engine from the following data :

Cylinder bore : 110 mm; stroke length : 125 mm

Length of connecting rod : 300 mm

Speed : 1600 rpm mass of the reciprocating parts : 2.2 kg;

Maximum explosion pressure : 3 N/mm^2

Compression ratio : 7 : 1

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With proper assumptions design the section, big end and small end of the connecting rod. **20**

OR

16. Determine the main dimensions of a cone clutch faced with leather to transmit 30 kW at 750 rpm from an electric motor to an air compressor. Find also the axial force that must be produced by the spring.

Assume : semi-angle of the cone = $12\frac{1}{2}^{\circ}$, μ = 0.2 to 0.3 ; mean diameter of cone = 6 to 10 d ; allowable normal pressure for leather and cast iron = 0.075 to 0.105 N/mm^2 Load factor = 1.75 and mean diameter to face-width ratio = 6. **20**
