

**B.TECH SEM – VIII (2007 COURSE) (MECHANICAL
ENGG.) : WINTER - 2017**

SUBJECT : MACHINE DESIGN – III

Day : **Thursday**
Date : **23/11/2017**

W-2017-2694

Time : **02.30 PM TO 06.30 PM**
Max. Marks : 80

N.B.

- 1) Q.1 and Q.5 are **COMPULSORY**. Out the remaining attempt any **TWO** questions from each section.
- 2) Figures to the right indicate **FULL** marks.
- 3) Answer to both the sections should be written in **SEPARATE** answer book.
- 4) Use of non-programmable calculator is allowed.
- 5) Assume suitable data if necessary.

SECTION – I

- Q.1**
- a) What is hypoid gear? Why is it used in Automobile? (04)
 - b) What is Autofrettage? (05)
 - c) What are the desirable properties for cylinder and cylinder liners? (05)

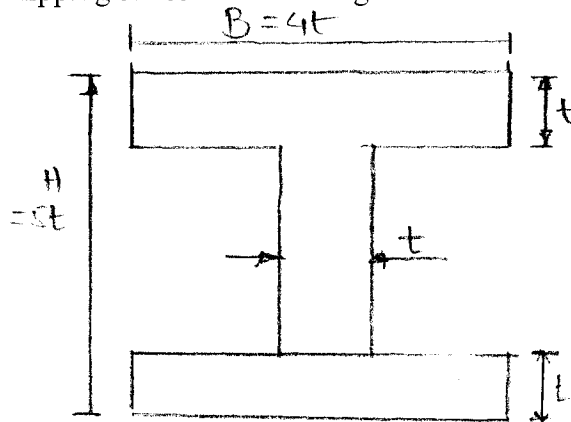
- Q.2**
- A high pressure cylinder consists of a steel tube with inner and outer diameters of 20 mm and 40 mm respectively. It is jacketed by an outer steel tube, having outer diameter of 60 mm. The tubes are assembled by a shrinking process in such a way that maximum principal stress induced in any tube is limited to 100 N/mm². Calculate the shrinkage pressure and original dimension of tube (E= 207/kNmm²). In service the cylinder is further subjected to internal pressure of 300 MPa. Plot the distribution of stresses due to shrink fit and resultant stress distribution. (13)

- Q.3**
- a) What are the advantages and disadvantages of worm gear drives? (06)
 - b) A pair of bevel gears is transmitting 7.5 kW at 500 rpm. The diameter of pinion and gear is 200 mm and 300 mm respectively with the pinion driving. The pressure angle is 20°. Determine the components of resultant gear tooth force. (07)

- Q.4**
- a) What are the guidelines for design of piston rings? (06)
 - b) The following data is given for a connecting rod: (07)
Engine Speed = 1800 rpm
Length of connecting rod : 350 mm
Length of stroke = 175 mm
Density of material = 7800 kg/m³
Thickness of web or flanges = 8 mm
The cross-section is illustrated in figure below.

$$\text{Also, } A = 11t^2 \quad I_{xx} = \left(\frac{419}{12}\right)t^4 \quad \text{and } y = \left(\frac{5t}{2}\right)$$

Calculate whipping stress in connecting rod.



P.T.O.

SECTION – II

- Q.5** a) What is design tolerance? What is natural tolerance? (05)
b) What are primary equations? What are secondary equations? What are limit equations? (05)
c) What is benefit cost analysis? (04)

Q.6 It has been observed that from a sample of 200 bearings bushes that internal diameters are normally distributed with mean of 30.010 mm and standard deviation of 0.008. The upper of lower limits for internal diameter are 30.02 and 30.00 mm respectively. Calculate the percentage of rejected bushes. Also what will be the effect of changing the upper and lower limits for internal diameter to 30.04 and 28.96 on percentage of rejection? (13)

Z	Area	Z	Area
1.20	0.3849	3.65	
1.25	0.3944	3.7	0.4999
1.3	0.4032	3.75	
1.35	0.4115	3.8	

Q.7 Discuss the application of Johnson's method of optimum design applied for torsion bar. (13)

- Q.8** a) Write a short note on product life cycle. (07)
b) An investor wishes to have Rs. 1,00,00,000 at the end of his investment period of 20 years. If he can earn 10% annual return compounded annually on his investments, what is the lumpsum amount he needs to invest today? (06)

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