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SE-7461

B. E. - IV (Sem - VII) (Mech.) Examination

May / June – 2011

Machine Design - II

Time : Hours] [Total Marks : **100**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **B. E. - IV (Sem - VII) (Mech.)**

Name of the Subject :

☛ **Machine Design - II**

☛ Subject Code No. : **7 4 6 1** ☛ Section No. (1, 2,.....) : **1, 2**

Seat No. :

Student's Signature

(2) Attempt all questions.
(3) Figures to the right indicate marks.
(4) Draw neat sketches wherever required.
(5) Assume suitable data, if necessary.
(6) Use of univiersity recommanded design data book is permissible.

SECTION - I

1 (a) Attemt any three : **10**

(i) State the reason for considering dynamic load in gear design and how it is considered.

(ii) State and explain general design consideration made in gearbox design.

(iii) State the different types of gear constructional details and explain any one of them.

(iv) List the different types of belt tensions adjustment devices. Explain any one of them.

(v) State the advantages and disadvantages of belt drives over other power transmission system.

(b) The following data refer to a v-belt drives : **10**

Power to be transmitted = 30 kW.
Speed of electric motor = 1440 r.p.m.
Speed of machine pulley = 480 r.p.m.
Centre distance between the shafts = 1 meter.

Groove angle for V-belt = 38^0
Coefficient of friction = 0.2
Density of belt material - 1000 kg/m^3
Allowable belt tension - 1.53 MPa.
Cross-sectional area of belt = 700 mm^2
Calculat (i) pulley diameters (ii) the minimum number of belts required, considering maximum power transmission capacity.

2 (a) The following particulars refer to a spur gear pair : **12**
No. of teeth on pinion = 17
No. of teeth on gear = 68
Pressure angle = 20^0
Module = 2.5 mm
Face width = 25 mm
Surface hardness - 250 BHN
Permissible tooth error - 0.08872 mm
Find (i) the optimum speed for maximum power transmission capacity and (ii) the maximum power transmission capacity of gears at the above speed.

(b) State and explain the advantages of helical gears over spur gears. **03**

OR

2 (a) Design a pair of helical gear from the following data : **12**
Power to be transmitted = 2.5 kW.
No. of teeth on pinion = 24
No. of teeth on gear = 96
Pinion speed = 10000 r.p.m.
Pressure angle = 20^0
Helix angle = 23^0
Materials for pinion and gear - hardened steel - $\sigma_{ult} = 600\ MPa.$
Factor of safety = 2
Service factor = 1.5
Permissible tooth error = 0.020 mm.
Initially assume pitch line velocity as 10 m/sec. to calculate module. Check your design for dynamic load and wear load.

(b) Explain the different types of bevel gears. **03**

3 (a) Explain the importance of thermal considerations in worm and worm gear design. **03**

(b) Design a pair of straight bevel gears from the following data : **12**

No. of teeth on pinion = 24 teeth

No. of teeth on gear = 32 teeth

Power to be transmitted = 12.5 kW

Pinion speed - 1440 r.pm.

Service factor = 1.5

Pressure angle = 20^0

Shaft position - intersecting at right angles.

Materials for both gears - case hardened steel $\sigma_{ult} = 450 MPa.$

Factor of safety = 2

Permissible tooth error = 0.050 mm.

Initially consider pitch line velocity as 7.5 m/sec.

OR

(b) Explain the step by step design procedure of an hoisting unit of an E.O.T. crane. (Draw neat sketches also). **12**

SECTION - II

4 (a) Attempt the following questions. **10**

(1) What is the difference between stresses in thin and thick cylinder ?

(2) State the advantages and disadvantages of hydrostabic lubrication.

(3) Explain reliability in detail.

(4) What is static and dynamic load capacity of bearing?

(5) Explain the classification of brakes.

(b) Following data are given for a 360^0 hydrodynamic bearing : **10**

Radial load = 30kN, Journal diameter = 75 mm, bearing length = 75 mm, Journal speed = 3600 rpm, Radial clearance = 0.15 mm, Inlet temp. = 40^0C. Assume $H_g = H_d$ the specific gravity of oil is 0.86 & specific heat of oil = 1.76 kJ/kg^{0}C. Calculate (1) power lost in friction (2) the requirement of oil flow.

5 Attempt any two. **14**

(1) A centrigugal clutch transmitting 20kN at 750 mm consists of four shoes. The clutch is to be engeged at 500 rpm. The inner radius of 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 N/mm^2. The arc of contact of friction lining = 70^0 Calculate (1) mass of each shoe (2) the dimensions of friction lining.

(2) Explain the internal expanding brakes in detail.

(3) Derive an expression for torque transmitting capacity of single plate clutch for both the theories.

6 (a) A single row deep groove ball bearing is subjected to a 30 second work cycle for following parts. **10**

	Part I	*Part I*
Duration (Sec)	10	20
Radial load (kN)	45	15
Axial load (kN)	12.5	6.25
Speed (RPM)	720	1440

The static load capacity = 50 kN

Dynamic load capacity = 68 kN

Calculate the bearing life in hrs.

(b) Attempt any one **6**

(1) Derive the Stribeecks equation of rolling contact bearing.

(2) Explain thermal consideration in brake's design.