Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER– I (OLD course)• EXAMINATION – SUMMER 2015

Subject Code: 710801 Date: 11/05/2015

Subject Name: Advanced Machine Design

Time: 10:30 am to 1:00 pm Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Define the term ñDesignò. Also explain that it is an iterative process with the help of Asimoôs model. **07**

(b) Explain in brief: (i) Concurrent engineering (ii) Whistle blowing **07**

Q.2 **(a)** Differentiate between ñstrength designò & ñstiffness designò. **07**

(b) A forged steel bar, 50 mm in diameter, is subjected to a reversed bending stress of 250 N/mm^2. The bar is made of steel 40C8 (S_{UT}=600 N/mm^2).Calculate the life of the bar for a reliability of 90%.Take K_a=0.43, K_b=0.85, K_c=0.897. **07**

OR

(b) Explain the stress concentration. Also define & differentiate between ñ Form stress factorò & ñ Actual stress concentration factor ò **07**

Q.3 **(a)** A hoisting drum, carrying a steel wire rope, is mounted at the end of a cantilever beam as shown in figure: 1. Determine the equivalent spring constant of the system when the suspended length of the wire rope is óLô. Assume that the net cross-sectional diameter of the wire rope is ódô and the Youngôs modulus of the beam and the wire rope is óEô. Spring constant of cantilever beam is $k_b=3EI/b^3$. **07**

(b) State and explain the principles of design for manufacturing and assembly. **07**

OR

Q.3 **(a)** The stresses at appoint in a body are: f_x=91 MN/m^2, f_Y=21 MN/m^2, f_{xy} =84 MN/m^2, yield point stress =280 MN/m^2.Find the factor of safety: (i) By the maximum shear stress theory and (ii) By the distortion energy theory. **07**

(b) What is profile correction of gears? Explain characteristics of corrected gears. **07**

Q.4 **(a)** Explain the stress distribution in solid rotating hollow disc. **07**

(b) A steam turbine rotor is to be designed so that the radial and circumferential stresses are to be the same and constant throughout and equal to 90 MN/m^2, when running at 4000 rpm. If the axial thickness at the center is 20 mm, what is the thickness at a radius of 400 mm? Assume density of material of the rotor is 7800 kg/m^3. **07**

OR

Q.4 **(a)** What do you understand by prestressing of cylinder? what are its advantages? **07**

(b) A high pressure cylinder consists of a steel tube with 20 and 35 mm as inner and outer diameters respectively. It is jacketed by outer steel tube with 50 mm outer diameter. The tubes are assembled by shrinking process in such a way that the maximum principle tensile stress induced in any tube is restricted to 100 MPa. Calculate the shrinkage pressure and original dimensions of the tube. Sketch the distribution of principal stresses in compound cylinder. Take modulus of elasticity E = 200*10^3 N/mm^2. **07**

Q.5 **(a)** Distinguish between ñHydrodynamic bearingò and ñHydrostatic bearingò with neat sketch. **07**

(b) Following data is given for a 360 degree hydrodynamic journal bearing: **07**
Radial load = 3.2 kN; journal speed = 1490 rpm; journal diameter = 50 mm; bearing length = 50 mm; radial clearance = 0.05 mm; viscosity of lubricant = 25 cP. Assume that total heat generated in the bearing is carried by the total oil flow in the bearing, calculate: (i) the coefficient of friction (ii) power lost in friction (iii) minimum oil film thickness (iv) flow required in liter/minute and (v) temperature rise. Take $(r/c)*f = 3.22$; (h_0/c) 0.4; $(Q/rcn_sl) = 4.33$.

OR

Q.5 **(a)** Discuss the basic objective of material handling system **07**

(b) Design a crane hook as shown in figure: 2 for lifting capacity of 5 tons. It is made from forged steel and has approximately triangular section. Take permissible tensile stress 80 N/mm^2 for forged steel and K = 12. **07**

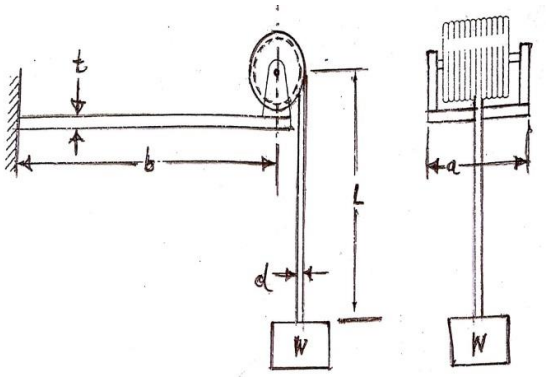

Figure : 1 (Que : 3(a))

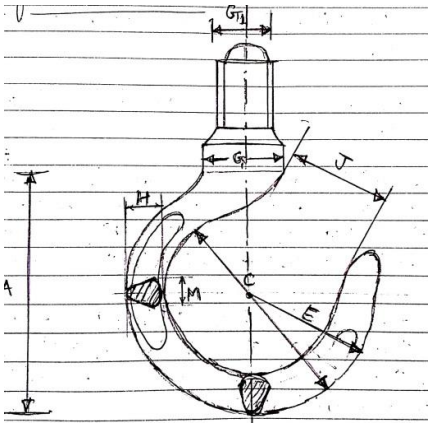

Figure : 2 (Que : 5(b))

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