B.TECH SEM – V (2007 COURSE) (PRODUCTION ENGG.) :
WINTER - 2017
SUBJECT: KINEMATICS & DESIGN OF MANUFACUTRUING MACHINES

Day: **Saturday** Time: **02.30 PM TO 05.30 PM**
Date: **13/01/2018** **W-2017-2480** Max. Marks : 80

N.B.:

1) **Q. No. 1 and Q. No. 5** are **COMPULSORY**. Out of 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 books.
4) Draw neat diagrams **WHEREVER** necessary.

SECTION-I

Q.1 **a)** Explain type synthesis and number synthesis in detail. **(05)**

b) State different types of drive. Describe the gear drive with its merits, demerits and applications. **(05)**

c) What are the design considerations in welding process? **(04)**

Q.2 **a)** Derive the Freudensteins equation for 4 bar mechanism. **(06)**

b) Synthesize a slider crank mechanism so that the displacement of the slider is proportional to the square of the crank rotation in the interval $45^0 \leq Q \leq 135^0$. Use three precision points. Assuming $S_s = 100$ mm and $S_F = 30$ mm. **(07)**

Q.3 **a)** What is Beam strength of helical gear tooth? Also prove that $F_b = 6_b .b.m_n .Y$. **(06)**

b) A spur pinion having 20 teeth is to mesh with a gear having 43 teeth. The pinion and gear are to be made of plain carbon steels having ultimate tensile strengths of 600 N/mm^2 and 400 N/mm^2 respectively. The pinion is to be driven by a three phase induction motor having a speed of 1440 r.p.m. and 10 Kw rating. The starting torque of the motor is twice the working torque. If the surface hardness of the gear pair is to be 400 BHN, design a gear pair with a factor of safety of 1.5. Assume the velocity factor accounts for the dynamic load. **(07)**

Q.4 **a)** Explain Man Machine Relationship as a ergonomic considerations in design. **(06)**

b) Describe Aesthetic consideration in design. Also explain in detail what are factors affects it. **(07)**

SECTION-II

Q.5 **a)** Define dry friction, explain friction in turning pairs. **(04)**

b) What are the causes of vibration? Also enumerate merits and demerits of vibrations. **(05)**

c) What is the importance of factor of safety in design process? **(05)**

P.T.O.

Q.6 **a)** What is hydrodynamic lubrication? Show that the maximum total force is **(06)**

$$F = \frac{0.133\mu.v.B^3}{h_0^2}.$$

b) Design straight flat guides for precision cylindrical grinding machine. The guides are to be work under lubrication. The lubrication chosen is antistic slip oil with polar additives having a coefficient of kinetic viscosity $\mu = 0.007kg$ sec/m^2. The minimum thickness of the oil film under the dynamic condition arising out of a micro error and macro error of the surface is 0.01mm. If the maximum sliding velocity of the carriage is limited to 3m/min and the maximum load on each guide is not to exceed 750 kg. Find out the dimensions of the guide (Length and breadth) assuming that the maximum identify of pressure on the guide does not exceed 0.5 kg/cm^2. **(07)**

Q.7 **a)** The disc of tensional pendulum has a mass moment of Inertia of 0.06 kg.m^2 and is immersed in a viscous fluid. The brass shaft attached to it is of 0.1 meter diameter and 0.4 meter long. When the pendulum is vibrating, the observed amplitudes on the same side of the rest position for successive cycles are 9^0, 6^0, 4^0 determine: **(07)**

i) logarithmic decrement (δ)
ii) damping torque at unit velocity (C)
iii) The periodic time of vibration (t_d)

Assuming for the brass shaft G = 4.4 $\times 10^{10}$ N/m^2. What would be the frequency, if the disc is removed form the viscous fluid?

b) Derive an equation of natural frequency of vibration for spring-mass system under coulomb damping condition. **(06)**

Q.8 **a)** Define limits, fits, tolerance and allowances also explain analysis of tolerance. **(06)**

b) A thin spherical pressure vessel is subjected to an internal pressure of 4 N/mm^2. The mass of the empty vessel should not exceed 125 Kg. Factor of safety is 3. Design the pressure vessel with the objective of maximizing the gas storage capacity, out of the following materials. **(07)**

Material	Ultimate tensile strength, S_{ut}, (N/mm^2)	Mass density ρ (kg/m^3)
Low alloy steel	500	7800
Aluminum alloy	250	2800
Copper alloy	420	8400

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