B.Tech. SEM -V Production 2014 Course (CBCS) : WINTER - 2018

SUBJECT: KINEMATICS & DESIGN OF MANUFACTURING MACHINES

Day: Saturday | **W-2018-2426** | Time: 02.30 PM TO 05.30 PM

Date: 24/11/2018 | Max. Marks: 60

N.B.:

1) All questions are **COMPULSORY**.
2) Draw neat and labeled diagrams **WHEREVER** necessary.
3) Figures to the right indicate **FULL** marks.
4) Assume suitable data if necessary.

Q.1 Derive an equation to find out the velocity of a point in a coupler curve for four bar mechanism. **(10)**

OR

Q.1 In a slider crank mechanism, the crank OC is 200 mm and the connecting rod CP is 750 mm. The line of stroke of the slider is offset by a perpendicular distance of 50 mm. If the crank rotates at an angular speed of 20 rad/sec and angular acceleration of 10 radlsec^2 .Find for the 60^0 rotation of crank. **(10)**

i) Distance of the slider from crank centre.
ii) Angular position of connecting rod.
iii) Linear velocity of slider.

Q.2 Derive lewis equation and explain beam strength of gear tooth. **(10)**

OR

Q.2 The helical rack and pinion arrangement to be used to drive the machine tool table at a linear speed at 1.5 m/s. The rack mounded on the lower side of the table is in mesh with the pinion driven by reversible electric motor running at 720 rpm. The tangential force acting on the table is 800 N. The rack is to be made of plain carbon steel 55C8 (Sut= 720 N/mm^2).While the pinion is to be made of alloy steel 15Ni2crlmo15(Sut=800 N/mm^2). The starting torque at the motor is 125% of the rated torque. The tooth system is 20^0 full depth involute. The face width is 12 times the normal module .The helix angle is approximately 26^0. The rack and pinions are to be case hardened to 350 BHN and 400 BHN respectively. The required factor of safety is 1.5.Assuming the velocity factor accounts for dynamic load design the rack and pinion. Calculate the power rating of an electric motor. **(10)**

Q.3 What are the general principles of design for following processes? **(10)**

i) Machining
ii) Manufacturing Assembly

OR

Q.3 What are the contribution of following factors in Aesthetics **(10)**

i) Color
ii) Surface finish
iii) Material
iv) Curves at corners
v) Joints

P.T.O.

Q.4 Design straight flat guides for precision cylindrical grinding machine .The guides are to be work under lubrication. The lubrication chosen is anti stick slip oil with polar additives having a coefficient of kinetic viscosity μ =0.007 kg sec/m^2. The minimum thickness of oil film under the dynamic condition arising out of micro error and macro error of the surface is 0.01 mm. If the maximum sliding velocity of the carriage is limited to 3 m/min and the maximum load on each guide is no to exceed 750 kg. Find out the dimensions of the guide (length and breadth) assuming that the maximum intensity of pressure on the guide does not exceed 0.5 kg/cm^2 **(10)**

OR

Q.4 What is hydrodynamic lubrication? Show that maximum total force in hydrodynamic lubrication is $F = \frac{0.133\mu v B^3}{h_o^2}$ **(10)**

Q.5 Describe the dry or coulomb damping with neat sketch also calculate the natural frequency and time period to complete one cycle.(consider mass is displaced towards right and moving towards left). **(10)**

OR

Q.5 A machine of 75 kg is mounted on three springs each of stiffness 10 N/mm and is fitted with a dashpot to damp out vibration, during vibrations it is found that amplitude of vibrations diminishes from 38.4 mm to 6.4 mm in two complete oscillations. **(10)**

Determine,

i) The resistance of dashpot at unit velocity.
ii) The frequency ratio of damped vibrations to undamped vibrations.
iii) The periodic time of damped vibrations.

Q.6 Explain the relation between design tolerance and natural tolerance with neat sketch. Also state its importance in manufacturing. **(10)**

OR

Q.6 In light weight equipment a shaft is require to transmit 40 Kw power at 425 rpm. The required stiffness of the shaft is 90 Nm/ degree. The factor of safety based on yield strength in shear is 1.5.Using the maximum shear stress theory design the shaft with the objective of minimizing the weight out the following materials .What will be the changes in design for minimum cost? **(10)**

Material	Mass density Kg/m^3	Material cost per unit mass weight (c),Rs./Kg	Tensile yield strength(Syt) N/mm^2	Modulus of Rigidity (G) N/mm^2
Alloy Steel	7800	1.50	450	82x10^3
Aluminum Alloy	2800	6.75	150	27x10^3
Titanium Alloy	4500	112	800	41x10^3
Magnesium Alloy	1800	7.65	100	17x10^3

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