B.TECH. SEM -V PRODUCTION 2014 COURSE (CBCS) : WINTER - 2017

SUBJECT: KINEMATICS & DESIGN OF MANUFACTUREING MACHINICS

Day: **Saturday** Time: **02.30 PM TO 05.30 PM**

Date: **13/01/2018** Max Marks. 60

W-2017-2163

N.B.

1) All questions are **COMPULSORY**
2) Figures to the right indicate **FULL** marks.
3) Use non – programmable calculator is **ALLOWED**
4) Assume suitable data if necessary.

Q.1 **a)** State the difference between machine and structure – What are the types of relative motion those takes place between various elements? **(05)**

b) What is Kinematics link? Classify kinematic pairs and explain any two with neat sketch. **(05)**

OR

Q.1 A four bar mechanism is to be designed by using three precision points to generate the function. **(10)**

$Y = x^{1.5}$ for the range $1 \leq x \leq 4$.

Assuming 30^0 starting position and 120^0 finishing position for the input link , and 90^0 starting position and 180^0 finishing position for the output link, find the values of X, Y, Q and ϕ corresponding to the precision points.

Q.2 **a)** Derive an equation for Beam strength of spur gear tooth (Lewis equation). **(07)**

b) Differentiate spur gear and helical gear. **(03)**

OR

Q.2 **a)** What are types of drives used to transmit the motion? Also state the merits and demerits of gear drives. **(04)**

b) The following data is given for a pair of helical gears made up of steel. **(06)**

i) Normal module = 5 mm
ii) Face width = 50 mm
iii) Number of pinion teeth = 30
iv) Number of gear teeth = 60
v) Centre distance = 245 mm
vi) Normal pressure angle - 20^0
vii) Pinion speed = 1000 r.p.m.
viii) Permissible bending stress for pinion and gear material = 150 N / mm^2
ix) Surface hardness = 300 B . H. N.
x) Factor of safety = 2
xi) Service factor = 1.5
xii) Grade of machining = 8

Determine

a) The helix angle
b) The beam strength
c) The wear strength
d) The dynamic load by Spott's equation
e) The maximum static load the gears can be transmit
f) The power transmitting capacity

(Assuming the Lewis form factor)

Q.3 **a)** What is the importance of Aesthetic consideration in design? **(04)**

b) What are the general principles in design for casting, forging and machining? **(06)**

P.T.O.

OR

Q.3 **a)** Explain the basic procedure of machine design. **(05)**

b) Describe the importance of Ergonomic considerations in design with neat sketch. **(05)**

Q.4 **a)** Explain design of guides under hydrostatic lubrication and derive an equation for total energy lost. **(07)**

b) What is the use of lubrication? State different types of lubricants. **(03)**

OR

Q.4 **a)** Derive an equation for maximum pressure for hydrodynamic lubrication in guide ways. **(07)**

b) Justify co – relation between friction and lubrication with an example. **(03)**

Q.5 **a)** Define vibration, state its causes and uses in different systems. **(03)**

b) The disc of a torsional pendulum has a moment of inertia of 0.06 kgm^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 from the viscous fluid?

OR

Q.5 **a)** Explain viscous damping with flash dash pot. **(05)**

b) Horizontal spring mass with coulomb damping has a mass 5 kg attached to a spring of stiffness 980 N/m . If the coefficient of friction is 0.025 **(05)**

calculate : i) The frequency of free oscillations

ii) The number of cycles corresponding to 50% reduction in amplitude if the initial amplitude is 50mm and.

iii)The time taken to achieve this reduction.

Q.6 **a)** Explain relation between design tolerance and natural tolerance with neat sketch. **(05)**

b) The bolt diameters are normally distributed with a mean of 10.01 mm and a standard derivation of 0.015 mm . The tolerance specified by the designer for the bolt diameter is 10 ± 0.025 mm. Calculate the percentage of bolts likely to be rejected **(05)**

(Take $A_1 = 0.4901$, $A_2 = 0.3413$)

OR

Q.6 **a)** Explain Johnson's method of optimum design considering normal specification. **(05)**

b) A tensile bar of length 200 mm is subjected to the constant tensile force of 5000 N. If the factor of safety is 3, design the bar with the objective of minimizing the material cost out of the following materials **(05)**

Material	Mass density $kg.m^3$	Material cost per unit mass Rs. / kg	Yield strength, N/ mm^2
Steel	7800	14	400
Aluminum Alloy	2800	66	150
Titanium Alloy	4500	1100	800
Magnesium Alloy	1800	75	100

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