B.Tech. SEM -V Production 2014 Course (CBCS) : SUMMER - 2019

SUBJECT: KINEMATICS & DESIGN OF MANUFACTURING MACHINES

Day: Saturday
Date: 11/05/2019

S-2019-2691

Time: 10.00 AM TO 01.00 PM
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 the equation to find out the velocity of point 'D' in a single slider crank mechanism with coupler point. **(10)**

OR

Q.1 Derive freudensteins equation for four bar mechanism. **(10)**

Q.2 Describe the spur Gear terminology with neat sketch. **(10)**

OR

Q.2 The following data is given for a pair of helical gears made of steel. **(10)**

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

Determine :

a) Helix angle
b) Beam strength
c) Wear strength
d) Dynamic load by spots equation
e) The maximum static load the gears can be transmits.

Q.3 Explain the man-machine Relationship as a ergonomic considerations in design. **(10)**

OR

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

i) Casting
ii) Forging

Q.4 Describe hydrostatic lubrication with neat sketch and derive the equation for pressure (p) **(10)**

OR

Q.4 The following data is given for the hydrostatic step bearing. **(10)**

i) Thrust load =450 kN
ii) Shaft speed = 750 r.p.m.
iii) Shaft diameter = 400mm
iv) Recess diameter = 250 mm
v) Viscosity lubricant= 30 Cp
vi) Specific gravity of lubricant = 0.86
vii) Specific heat of lubricant=2 kj/kg ^{o}C

Calculate :

a) The optimum oil film thickness for minimum power loss.
b) Frictional power loss
c) Pumping power loss
d) Temperature rise

Assume that the total power loss is converted into frictional heat. Show the variation of power losses against the oil film thickness.

Q.5 What is S.H.M.? Drive on expression $X = xsin\omega t$ as a simple harmonic motion in forced vibrations. **(10)**

OR

Q.5 A horizontal spring mass system with coloumb damping has a mass of 5 kg attached to a spring of stiffness 980 N/m. The coefficient of friction is 0.25 **(10)**
Calculate.

i) The frequency of free oscillations.
ii) The number of cycles corresponding to 50% reduction in amplitude if the initial amplitude is 50 mm and.
iii) The time taken to achieve this reduction.

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

OR

Q.6 A tensile bar 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 cast, out the following materials. **(10)**

Material	Mass density Kg/m^3 (ρ)	Material cost per unit mass (c), Rs/Kg	Yield strength(Syt) N/mm^2
Alloy Steel	7800	14	400
Aluminum Alloy	2800	66	150
Titanium Alloy	4500	1100	800
Magnesium Alloy	1800	75	100

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