

**B.TECH SEM – V (2007 COURSE) (PRODUCTION ENGG.) :**  
**SUMMER - 2018**

**SUBJECT: KINEMATICS AND DESIGN OF MANUFACTURING MACHINES**

Day : **Tuesday** **S-2018-2685** Time : **10.00 AM TO 01.00 PM**  
Date : **22/05/2018** Max. Marks: 80

**N. B.:**

- 1) **Q. No. 1 and Q. No. 5 are COMPULSORY.** Out of remaining attempt **ANY TWO** questions from each sections.
- 2) Answer to both the sections should be written in **SEPARATE** answer book.
- 3) Figures to the right indicate **FULL** marks.
- 4) Assume suitable data, if necessary.

**SECTION-I**

- Q.1 a)** Classify the different types of motion drives. State the merits and demerits of gear drives. **(05)**
- b)** Define kinematic link and explain different types of links. **(05)**
- c)** What are the manufacturing considerations in design? **(04)**
- Q.2 a)** In a slider crank mechanism the crank OC is 200 mm and the connecting rod CP is 750 mm. The line of stroke at 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  $10 \text{ rad/sec}^2$ . Find for the  $60^\circ$  rotation of crank. **(07)**
- i) Distance of the slider from crank center.
  - ii) Angular position of connecting rod.
  - iii) Linear velocity of slider.
  - iv) Angular velocity of connecting rod.
- b)** Derive a freudenstein's equation for four bar mechanism. **(06)**
- Q.3 a)** Derive the equation to determine the wear strength of helical gear. **(06)**
- b)** The pitch circle diameters of the spur pinion and gear are 100 mm and 300 mm respectively. The pinion and gear is made of plain carbon steel 40C8 ( $S_{ut} = 600 \text{ N/mm}^2$ ). The pinion receives 5 Kw power at 500 r.p.m. The service factor and factor of safety can be taken as 1.5 each. The face width of the gear can be taken as 10 times the module. If the velocity factors accounts for the dynamic load, calculate the module and the number of teeth on pinion and gear. **(07)**
- Q.4 a)** What are the requirements of machine element in design? **(06)**
- b)** Describe the importance of Aesthetic consideration in design. **(07)**

**P.T.O.**

## SECTION-II

- Q.5** a) Define vibration, also state its causes and applications. (05)
- b) Explain friction in turning pairs. Define friction axis and friction circle. (06)
- c) Define factor of safety and reliability. (03)
- Q.6** a) Describe hydrodynamic lubrication in guide ways also derive the equation for maximum pressure. (06)
- b) A cylindrical roller bearing having bore diameter of 40 mm is subjected to a radial load of 25 kN. The coefficient of friction is 0.0012. If the shaft rotates at 1440 r.p.m. Calculate the frictional power loss. (07)
- Q.7** a) A horizontal spring mass system with coloumb damping has a mass of 5 kg attached to a spring of stiffness 980 N/m. If the coefficient of friction is 0.025 calculate, (07)
- i) The frequency of free oscillations.
  - ii) The number of cycle corresponding to 50% reduction in amplitude if the initial amplitude is 50 mm.
  - iii) The time taken to achieve this reduction.
- b) What are the different types of damping? Explain viscous damping with neat sketch. (06)
- Q.8** a) Explain relation between design tolerance and natural tolerance with neat sketch. (06)
- b) A thin spherical vessel is subjected to an internal pressure of 4 N/mm<sup>2</sup>. The mass of the empty vessel should not exceed 125 kg. If the factor of safety is 3. Design the pressure vessel with the objective of maximizing the gas storage capacity. Out of the following materials. (07)

Materials	Ultimate Tensile strength(Sut) N/mm <sup>2</sup>	Mass density ( $\rho$ ) (kg/m <sup>3</sup> )
Low alloy steel 15Cr90Mo55	500	7800
Aluminum Alloy 74530	250	2800
Copper alloy CuNi31Mn1fe.	420	8400

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