Enrollment No: _____ Exam Seat No:_____

C.U.SHAH UNIVERSITY
Summer Examination-2017

Subject Name: Machine Design - II

Subject Code: 4TE07MDE1 **Branch: B.Tech(Mechanical)**

Semester: 7 **Date: 27/03/2017** **Time: 02:30 To 05:30** **Marks: 70**

Instructions:

(1) Use of Programmable calculator & any other electronic instrument is prohibited.
(2) Instructions written on main answer book are strictly to be obeyed.
(3) Draw neat diagrams and figures (if necessary) at right places.
(4) Assume suitable data if needed.
(5) Use of PSG Design data book is permitted in exam

Q-1 **Attempt the following questions:** **(14)**

a) In a gear speed reducer, why is the diameter of an output shaft greater than input shaft? **01**
b) In which gear drive is self-locking possible? **01**
c) What is the stub involute gear tooth system? **01**
d) Define cycloidal curve? **01**
e) What is crowing of gear teeth? **01**
f) What is the lead angle of the worm? **01**
g) What is reboring allowance? **01**
h) Why one end of connecting rod is made bigger than the other? **01**
i) What is a multi-throw crankshaft? **01**
j) What are the forces acting on rocker arm? **01**
k) State any one goal of material handling? **01**
l) What is AGMA? **01**
m) Define optimum design? **01**
n) What do you understand by containerization? **01**

Attempt any four questions from Q-2 to Q-8

Q-2 **Attempt all questions** **(14)**

a) Discuss in detail modified Lewis equation? Why it is required? **04**
b) Two parallel shafts 320 mm a part are to be connected by helical gears. The pinion is to have 30 teeth and rotates at 800 rpm. The speed reduction is 4:1. The helix angle is 35°, and gears are of 20° full depth involute teeth. The gears are made of carbon steel having ultimate strength of 450 MPa and the surface hardness is 300 BHN. Take service factor of 1.25 and FOS of 3. Determine on the static strength basis **10**
(i) Standard normal module
(ii) Width of face (Assume face width = 12 m)
(iii) Power transmission capacity on the basis of static load, if $K_S = 1.25$.

Q-3 **Attempt all questions** **(14)**

a) State the thermal consideration of worm & worm gear? **02**

b) Design a speed gear box for a head stock of a lathe o give speed variation from 100 to 1120 rpm in 8 steps. The power is supplied by an electric motor of 15 kW running at 1000 rpm, through a belt drive giving a speed reduction of 1.6:1. Draw the structural diagram, speed chart, and calculate the number of teeth on each gear. Also show the kinematic arrangement. **12**

Q-4 **Attempt all questions** **(14)**

a) Explain with neat sketch Piston Geometry? **04**

b) A speed reducer unit is to be designed for transmission ratio 27. The speed of the hardened steel worm is 1440 rpm. The worm wheel is to made of phosphor bronze. The tooth form is to be 20° involute. Take center distance 100 mm. **10**

Q-5 **Attempt all questions** **(14)**

a) State the design procedure for crankshaft? **04**

b) Design a cast iron piston for a single acting four stroke engine for the following data: **10**

Cylinder bore = 100 mm
Stroke = 125 mm
Maximum gas pressure = 5 N/mm^2
Indicated mean effective pressure = 0.75 N/mm^2
Mechanical efficiency = 80%
Fuel consumption = 0.15 kg / BPH
Higher calorific valve of fuel = 42 x 103 kJ/kg
Speed = 2000 rpm
Any other data required for the design may be assumed.

Q-6 **Attempt all questions** **(14)**

a) Explain screw conveyors in brief? **04**

b) Design a rocker arm and exhaust valve for a 4-stroke diesel engine from the following data: **10**

Bore = 100 mm, stroke = 120 mm
Mean gas velocity = 60 m/s
Maximum gas pressure = 3.5 MPa
Effective reciprocating mass = 0.3 kg
Exhaust gas pressure = 0.35 MPa
Spring pressure = 0.028 MPa
Total angle of cam action = 120°
Operating speed = 1600 rpm
Length of moment arms : 140 mm & 150 mm
Cross-section of the rocker arm: elliptical, with major axis twice the minor axis.
Motion of follower : S.H.M

Q-7 **Attempt all questions** **(14)**

a) Give the classification of wire rope and its construction with neat sketches. How does the flexibility of wire rope influenced by its construction? **06**

b) The initial preload for a helical compression spring is 675 N. the maximum **08**

spring load is limited by permissible torsional shear stress of the spring wire, which is 750 MPa. Due to space limitations, the outer diameter of spring should not exceed 50 mm. specify the spring dimensions for minimum weight.

Q-8 **Attempt all questions** **(14)**

a) State the classification of material handling equipment? **06**

b) State the belt requirement used in conveyor system? **04**

c) Explain vertical gravity take-up mechanism in detail with neat sketch? **04**