Enrollment No: _____ Exam Seat No:_____

C.U.SHAH UNIVERSITY

Summer Examination-2019

Subject Name: Automobile Component Design

Subject Code: 4TE06ACD1 **Branch: B.Tech (Automobile)**

Semester: 6 **Date: 30/04/2019** **Time: 10:30 To 01:30** **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.

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

a) The point of contact of two pitch circles of mating gears is called 01

A) Pressure point B) Pitch point C) Module D) Contact point

b) Which of the following type of gear has inclined teeth? 01

A) Spur gear B) Helical gear C) Spiral gear D) None of the above

c) The circular pitch of a gear is given by 01

A) Πd/t B) Πd/2t C) 2Πd/t D) Πd/3t

d) Which of the following does not give velocity ratio of gears? 01

A) ω2/ω1 B)D1/D2 C) N1/N2 D) T1/T2

e) Which of the following is a form of teeth? 01

A) Cycloidal B) Spherical C) Helical D) None of the above

f) In worm and wheel, the shaft axes are at 01

A) 90 degrees B) 45 degrees C) 180 degrees D) 270 degrees

g) What is L_{50} life? 01

h) Herringbone gear can be used in 01

A) Intersecting shafts only B) Parallel shafts only C) Both intersection and parallel shafts D) None of the above

i) Which of the following is not true about gears? 01

A) Positive drive B) Constant velocity ratio C) Transmit large power D) Bulky construction

j) Bevel gears impose ____ loads on the shafts. 01

A) Radial and B) Radial C) Thrust D) Neither radial

thrust | | | nor thrust

k) Which of the following can be used for power transmission in intersecting shafts? 01

A) Spur Gear | B) Helical Gear | C)) Bevel Gear | D) None of the above

l) Which type of gear box is used in automobiles? 01

A) Sliding mesh gear box | B) Differential gear box | C) Synchromesh gear box | D) All of the above

m) The angle at which the teeth of the gear are inclined to the axis of a gear is called as 01

A) pitch angle | B) normal angle | C) helix angle | D) gear angle

n) Which of the following pressure angle (in degrees) is commonly used for gears? 01

A) 15 | B) 20 | C) 25 | D) 30

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

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

(a) Define the following terms: **07**

(1)Addendum, (2) Clearance, (3) Face, (4) Flank, (5) Module, (6) Circular pitch, and (7) Thickness of tooth

(b) Explain design procedure of Helical gear. **07**

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

(a) A bronze spur pinion rotating at 600 r.p.m. drives a cast iron spur gear at a Transmission ratio of 4 : 1. The allowable static stresses for the bronze pinion and cast iron gear are 84 MPa and 105 MPa respectively. **07**

The pinion has 16 standard 20° full depth involute teeth of module 8 mm. The face width of both the gears is 90 mm. Find the power that can be transmitted from the standpoint of strength.

The tooth form factor y can be taken as

$$y = 0.154 - \frac{0.912}{No.\ of\ teeth}$$

and the velocity factor C_v as

$$C_v = \frac{3}{3+v},\ where\ v\ is\ expressed\ in\ m/s.$$

(b) Explain causes of Gear tooth failure. **07**

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

(a) State the advantages and disadvantages of worm gear drive. **07**

(b) A pair of straight bevel gears connecting two shafts at right angle has pinion teeth 24, and gear teeth 48. The module at the outside diameter is 6 mm, and faces width 50 mm. the gears are made of grey cast iron FG 220. The pressure angle is 20º. The gear teeth are generated. The pinion speed is 300 rpm. Taking a service factor of 1.5, and Factor of Safety of 2, find **07**

(i) Beam strength of tooth
(ii) Static strength of tooth
(iii) Wear load
(iv) Rated power that the gear can transmit, if σ_{es} = 550 MPa.

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

(a) Explain briefly Geometric Progression and Arithmetic Progression method. **07**

(b) Design s speed gear box for a head stock of a lathe to 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, **07**

speed chart and calculate the number of teeth on each gears.

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

(a) Derive the petroff's equation to find coefficient of friction for a light loaded bearing, with concentric journal. **07**

(b) A lightly loaded bearing 80 mm long has 80 mm diameter and supports a radial load of 3000 N. the clearance ratio (c/r) = 0.001. The lubricating oil SAE 30 has viscosity of 33 * 10^{-3} PaS at 60º C. The shaft speed is 750 rpm. The end leakage factor (k) = 0.002. **07**

Find (i) Co – efficient of friction

(ii) friction torque developed

(iii) Power lost in friction.

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

(a) Give comparison of Journal bearing and Rolling contact bearing. **07**

(b) Determine the thickness of cylinder, cylinder head, number of bolts, size of bolt and pitch of bolt for a 4 – stroke diesel engine cylinder of 250 mm bore and allowable stress of 42 MPa. Take maximum explosion pressure of 3 N/mm^2. **07**

Take σ_t = 65 MPa for Ni – steel bolts and k = 7.5 mm

Also find outer diameter of cylinder flange.

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

(a) Explain the term "whipping stress" in context with connecting road. **07**

(b) Design an aluminium alloy piston for 4 – stroke 4 – cylinder petrol engine from the following data: **07**

Cylinder bore = 100 mm

Stroke length = 128 mm

Maximum explosion pressure = 2.5 MPa

Power developed = 80 kw

Specific fuel consumption = 180 gm/kwh

Speed = 2500 rpm

Permissible tensile stress for material of piston = 40 MPa

Permissible bending stress for pinion pin = 120 MPa

Assume necessary data if required.