Enrollment No: _____   Exam Seat No: _____

C.U.SHAH UNIVERSITY
Summer Examination-2017

Subject Name: Automobile System Design

Subject Code: 4TE05ASD1   **Branch: B.Tech (Automobile)**

Semester: 5   **Date: 24/03/2017**   **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) Develop R20 series from 1 to 10   **01**
  b) What is creep strength?   **01**
  c) Why cast iron components made of uniform thickness?   **01**
  d) What is transmission shaft?   **01**
  e) By what means power is transmitted by clutch?   **01**
  f) Why are asbestos friction materials prohibited in number of countries?   **01**
  g) What type of brake is used in passenger vehicle?   **01**
  h) A clutch has outer and inner diameters 100 mm and 40 mm respectively. Assuming a uniform pressure of 2 MPa and coefficient of friction of liner material 0.4, the torque carrying capacity of the clutch is……..   **01**
   a. 148 Nm   b. 196 Nm   c. 372 Nm   d. 490 Nm
  i) The ratio of tension on the tight side to that on the slack side in a flat belt drive.   **01**
   a. Proportional to the product of coefficient of friction and lap angle
   b. An exponential function of the product of coefficient of friction and lap angle
   c. Proportional to the lap angle
   d. Proportional to the coefficient of friction
  j) The difference between tensions on the tight and slack sides of a belt drive is 3000 N. If the belt speed is 15 m/s, the transmitted power in k W is …….   **01**
  k) In a 6✕20 wire rope, No.6 indicates the……..   **01**
  l) In a flat belt drive the belt can be subjected to a maximum tension T and centrifugal tension T_c. What is the condition for transmission of maximum power?   **01**
  m) Fatigue strength of a rod subjected to cyclic axial force is less than that of a rotating beam of the same dimensions subjected to steady lateral force. What is the reason?   **01**
   a. Axial stiffness is less than bending stiffness

b. Absence of centrifugal effects in the rod
c. The number of discontinuities vulnerable to fatigue is more in the rod
d. At a particular time, the rod has only one type of stress whereas the beam has both tensile and compressive stresses

n) The design calculations for members subject to fluctuating loads with the same factor of safety yield the most conservative estimates when using. **01**
a. Gerber relation
b. Soderberg relation
c. Goodman relation
d. none of the above

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

Q-2	**Attempt all questions**	**(14)**
a)	What are the guidelines for selecting the number of teeth for sprocket in roller chain drive?	**04**
b)	The percentage improvement in power capacity of a flat belt drive, when the wrap angle at the driving pulley is increased from 150° to 210° by an idler arrangement for a friction coefficient of 0.3?	**04**
c)	A forged steel bar, 50 mm in diameter, is subjected to reversed bending stress of 250 N/mm^2. The bar is made of steel 40C8 ultimate tensile stress 600 N/mm^2.Calucate the life of the bar for a reliability of 90%.	**06**

Q-3	**Attempt all questions**	**(14)**
a)	Justify 70 to 80% cost of product are determined by design decision and 30 to 20% cost by production decision	**06**
b)	Explain stress-cycle curve. How it is useful to the designer?	**04**
c)	A Differential pulley is subjected to belt tensions as shown in the diagram. Find the resulting force and moment when transferred to the centre of the pulley, respectively. And radius of pulleys 0.5 m and 0.25 m respectively	**04**
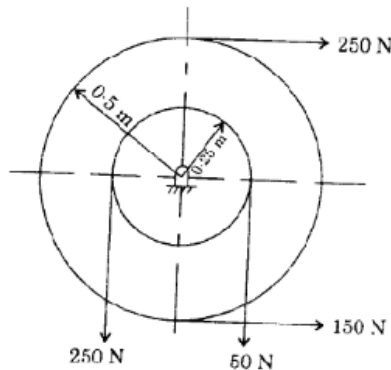
Q-4	**Attempt all questions**	**(14)**
a)	What is fatigue? Explain the significance of fatigue stress concentration factor and the notch sensitivity	**06**
b)	Following data is given for a caliper disk brake with annular pad, for the front	**08**

wheel of the motorcycle:

Torque capacity = 1500 N-m, outer radius of pad = 150 mm, inner radius of pad = 100 mm, coefficient of friction = 0.35, average pressure on pad = 2 MPa, number of pads = 2. Calculate the angular dimension of pad.

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

     a) Explain how stress can equalised in full length leave & graduated leave with neat sketch   **08**

     b) Explain following in detail.   **06**
(i) Torsional rigidity
(ii) Lateral rigidity

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

     a) A semi-elliptical leaf spring of an automobile suspension has a span of 1.1 m and width of central band is 100 mm. there are two extra full length leaves and eight graduated leaves including the master leaf. The spring material is 55Si2Mn90 steel having a yield point stress of 1500 MPa. The central load on the spring is 35 kN. And $E = 2.07 \times 10^5$ MPa. If b = 10h and FOS = 2. Find   **10**
(i) Width and thickness of leaves.
(ii) Maximum deflection of spring.
(iii) Eye diameter
(iv) Length of leaves
(v) Camber and Radius of curvature

     b) State the factors to be considered while selection of friction materials for clutch   **04**

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

     a) Design a cast iron pulley for the following specifications: **10**
Power to be transmitted = 17.5 Kw
Speed = 600 rpm
Maximum tension in belt = 15 N/mm width
Ratio of belt tension = 2.2 : 1
Allowable centrifugal stress in the rim = 7 MPa
Allowable stress for pulley = 14 MPa
Density of pulley material = 7200 kg/m^3
Allowable stress of shaft (τ) = 45 MPa

     b) Explain in detail modes of failure in chain drive   **04**

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

     a) A roller chain transmits 2.5 kW power at 600 rpm from a sprocket having 25 teeth. The number of teeth on sprocket wheel is 75. Find   **10**
(i) Pitch circle diameter of driving and driven sprockets.
(ii) Velocity of chain
(iii) Tension in the chain
(iv) Torque on the driven shaft
(v) Power rating

     b) Explain the design consideration for steering system   **04**