

Enrollment No: _____ Exam Seat No: _____

C.U.SHAH UNIVERSITY

Summer Examination-2016

Subject Name: Automobile System Design

Subject Code: 4TE05ASD1

Branch: B.Tech(Auto)

Semester: 5

Date: 25/04/2016

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.
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- Q-1** **Attempt the following questions:** **(14)**
- a)** The value of stress concentration factor depends upon **01**
- a. material of the part
 - b. geometry of the part
 - c. material and geometry of the part
 - d. none of these
- b)** An open belt drive is used when **01**
- a. shafts are arranged parallel and rotate in the opposite directions
 - b. shafts are arranged parallel and rotate in the same directions
 - c. shafts are arranged at right angles and rotate in one definite direction
 - d. driven shaft is to be started or stopped whenever desired without interfering with the driving shaft
- c)** The endurance limit for a mirror polished material will be _____ as **01**
compared to unpolished material.
- a. same
 - b. less
 - c. more
- d)** The material used for brake lining should have _____ coefficient of **01**
friction.
- a. low
 - b. high
- e)** Soderberg relation is based on _____ of the material whereas all other **01**
failure relation for dynamic loading are based on ultimate strength of the material.
- a. elastic strength
 - b. yield strength



- c. shear strength
- f)** A leaf spring in automobiles is used **01**
 a. to apply forces
 b. to measure forces
 c. to absorb shocks
 d. to store strain energy
- g)** When a material is subjected to fatigue loading, the ratio of the endurance limit to the ultimate tensile strength is **01**
 a. 0.20
 b. 0.35
 c. 0.50
 d. 0.65
- h)** Casting **01**
 a. fiber lines are arranged in predetermined way
 b. fiber lines of rolled stock are broken
 c. there are no fiber lines
 d. fiber lines are scattered
- i)** Stress concentration factor is defined as the ratio of **01**
 a. maximum stress to the endurance limit
 b. nominal stress to the endurance limit
 c. maximum stress to the nominal stress
 d. nominal stress to the maximum stress
- j)** In machined components **01**
 a. fiber lines are arranged in predetermined way
 b. fiber lines of rolled stock are broken
 c. there are no fiber lines
 d. fiber lines are scattered
- k)** Idler pulley is used for **01**
 a. increasing velocity ratio
 b. for applying tension
 c. changing the direction of motion of belt
 d. all of these
- l)** The clutch used in trucks is **01**
 a. centrifugal clutch
 b. cone clutch
 c. multiple disc clutch
 d. single disc clutch
- m)** The friction material of the brake should have **01**
 a. high coefficient of friction
 b. low coefficient of friction
 c. high surface hardness
 d. high endurance limit strength
- n)** As compared to belt drive, the chain drive transmits **01**
 a. more power
 b. less power



- c. same power
- d. none of above

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

Q-2	Attempt all questions	(14)
a)	State and Illustrate various principal design rules as per Casting Design.	07
b)	What is creep failure? Explain its various stages of failure.	07
Q-3	Attempt all questions	(14)
a)	A machine component is subjected to fluctuating stress that varies from 40 to 100 N/mm^2 . The corrected endurance limit stress for the machine component is 270 N/mm^2 . The ultimate tensile strength and yield strength of the material are 600 and 450 N/mm^2 respectively. Find the factor of safety using (i) Gerber theory (ii) Soderberg line (iii) Goodman line	09
b)	What is the cumulative fatigue damage? How the life of component subjected to different values of fluctuating stresses in cycle, is estimated by using Miner's equation?	05
Q-4	Attempt all questions	(14)
a)	A multiple disc clutch, steel on bronze, is to transmit 4.5 kW at 450 r.p.m. the inner radius of contact is 40 mm and outer radius of the contact is 70 mm. the clutch operates in oil with an expected coefficient of 0.1. The average allowable pressure is 0.35 N/mm^2 . Find: 1. The total number of steel & bronze discs; 2. The actual axial force required; 3. The actual average pressure; 4. The actual maximum pressure.	08
b)	Prove that "Brake should be self-energizing and not the self-locking"?	06
Q-5	Attempt all questions	(14)
a)	Following data is given for a caliper disk brake with annular pad, for the front 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.	08
b)	It is stated that the speed at which a belt should be run to transmit maximum power is that at which the maximum allowable tension is three times the centrifugal tension in the belt at that speed. Prove the statement.	06
Q-6	Attempt all questions	(14)
a)	An automobile engine develops a maximum torque of 162 Nm. The low gear ratio of transmission is 2.75, while the back axle ratio is 4.25. The effective wheel radius is 0.325 m and the coefficient of friction between the tyre and the road surface is 0.6. If the permissible shear stress is 32373×10^4 Pa, determine the maximum shaft diameter, assuming that the load is nearly torsional. What is the maximum load permissible on each wheel?	08



b) Explain the step by step design procedure for chain drive? **06**

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

a) A truck spring has 12 numbers of leaves, two of which are full length leaves. The spring supports are 1.05 m apart and the central band is 85 mm wide. The central load is to be 5.4 kN with a permissible stress of 280 MPa. Determine the thickness and width of the steel spring leaves. The ratio of the total depth to the width of the spring is 3. Also determine the deflection of the spring. **08**

b) Explain Steering geometry for Ackerman's with neat sketch **06**

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

a) Explain how stress can be equalised in full length leave & graduated leave? **07**

b) State the importance of standardization in automobile industries **04**

c) Why is the cross-section of the pulley an elliptical arm? Why is the major axis of the cross-section in the plane of rotation? **03**

