Enrollment No: _____ Exam Seat No:_____

C.U.SHAH UNIVERSITY
Winter Examination-2018

Subject Name: Automobile System Design

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

Semester: 5 **Date: 30/11/2018** **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) Interchangeability can be achieved by
 (a) Standardisation (b) better process planning
 (c) Simplification (d) better product planning

(b) Ergonomic deals with
 (a) Design of controls (b) Design of displays
 (c) Energy expenditure in hand and foot operations (d) all the three

(c) The endurance or fatigue limit is defined as the maximum value of the stress which a polished standard specimen can withstand without failure, for infinite number of cycles, when subjected to
 (a) static load (b) dynamic load
 (c) static as well as dynamic load (d) completely reversed load

(d) Stress concentration factor is defined as the ratio of
 (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

(e) In case of a multiple disc clutch, if n_1 are the number of discs on the driving shaft and n_2 are the number of the discs on the driven shaft, then the number of pairs of contact surfaces will be
 (a) $n_1 + n_2$ (b) $n_1 + n_2 - 1$
 (c) $n_1 + n_2 + 1$ (d) none of these

(f) A jaw clutch is essentially a
 (a) positive action clutch (b) cone clutch
 (c) friction clutch (d) disc clutch

(g) The material used for brake lining should have .... coefficient of friction.
 (a) low (b) high (c) zero (d) none of these

(h) The included angle for the *V*-belt is usually
 (a) $20° – 30°$ (b) $30° – 40°$ (c) $40° – 60°$ (d) $60° – 80°$

(i) The wire ropes make contact at
 (a) sides and bottom of groove of the pulley

(b) sides of groove of the pulley
(c) bottom of groove of the pulley
(d) anywhere in the groove of the pulley

(j) In order to have smooth operation, the minimum number of teeth on the smaller sprocket, for moderate speeds, should be
(a) 15   (b) 25   (c) 21   (d) 17

(k) In design of propeller shaft the relationship between engine torque and torque to be transmitted is given by:
Where G= Overall gear ratio.
(a) $T_t = T_e\, G$ (b) $T_t = G/\, T_e$ (c) $T_t = T_e\, /G$ (d) None of the listed

(l) Propeller shaft must be provided with a sliding joint that permits:
(a) take curves   (b) the effective length of shaft to change
(c) variations in the angle of drive   (d) all of these

(m) In leaf springs, the longest leaf is known as
(a) lower leaf   (b) master leaf   (c) upper leaf   (d) none of these

(n) The Ackerman steering gear mechanism is preferred to the Davis steering gear mechanism, because
(a) Whole of the mechanism in the Ackerman steering gear is on the back of the front wheels.
(b) the Ackerman steering gear consists of turning pairs
(c) the Ackerman steering gear is most economical
(d) both (a) and (b)

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

Q-2   **Attempt all questions**
(a) Explain the aesthetic and ergonomic considerations in design. **(03)**
(b) Standardize eight speeds for a drilling machine between *30* rpm to *800* rpm. **(04)**
(c) A steel rod is subjected to a reversed axial load of *180 kN*. Find the diameter of the rod for a factor of safety of *2*. Neglect column action. The material has an ultimate tensile strength of *1070 MPa* and yield strength of *910 MPa*. The endurance limit in reversed bending may be assumed to be one-half of the ultimate tensile strength. Other correction factors may be taken as follows:
For axial loading = *0.7*; For machined surface = *0.8*; For size = *0.85*; For stress concentration = *1.0*. **(07)**

Q-3   **Attempt all questions**
(a) Discuss the DFA guidelines in brief. **(07)**
(b) What is meant by endurance strength of a material? Explain Soderberg criterion. **(07)**

Q-4   **Attempt all questions**
(a) Describe with the help of a neat sketch, a centrifugal clutch and deduce an expression for the total frictional torque transmitted. **(07)**
(b) A belt drive consists of two V-belts in parallel, on grooved pulleys of the same size. The angle of the groove is 30°. The cross-sectional area of each belt is *750 mm²* and μ = *0.12*. The density of the belt material is *1.2 Mg/m³* and the maximum safe stress in the material is *7 MPa*. Calculate the power that can be transmitted between pulleys of *300 mm* diameter rotating at *1500* r.p.m. Find also the shaft speed in r.p.m. at which the power transmitted would be a maximum. **(07)**

Q-5 **Attempt all questions**

    (a) Write the design procedure for a chain drive. **(07)**

    (b) A disc clutch consists of *5* discs giving a total of four pairs of contact surfaces. **(07)** The outside diameter of the contact surface is to be *27.9 cm* and the inside *17.8 cm*. Determine the pressure with which the discs must be held together, if *22.5 kW* is to be transmitted at *700* rpm, assuming the coefficient of friction to be *0.3*.

Q-6 **Attempt all questions**

    (a) Discuss in detail the Ackermann steering mechanism for Automobile. **(07)**

    (b) An automobile engine develops *28kW* at *1500* rpm and its bottom gear ratio is **(07)** *3.06*. if a propeller shaft of *4 cm* outside diameter is to be used, determine the inside diameter of mild steel tube to be used, assuming a safe shear stress of *5625 N/cm²* for the M.S.

Q-7 **Attempt all questions**

    (a) Explain with neat sketch Full floating and Half floating axle. **(07)**

    (b) Design a cantilever leaf spring *60 cm* long to absorb *100000 N-cm* of energy **(07)** without exceeding a deflection of *20 cm*. Take permissible stress *90000 N/cm²* and modulus of elasticity *21 x 10⁶ kg/cm²*.

Q-8 **Attempt all questions**

    (a) Describe with schematic diagram Hydraulic Braking System. **(07)**

    (b) A rope pulley with *10* ropes and a peripheral speed of *1500 m/min* transmits *115* **(07)** *kW*. The angle of lap for each rope is *180°* and the angle of groove is *45°*. The coefficient of friction between the rope and pulley is *0.2*. Assuming the rope to be just on the point of slipping, find the tension in the tight and slack sides of the rope. The mass of each rope is *0.6 kg* per metre length.