Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII • EXAMINATION – SUMMER 2013

Subject Code: 170202 **Date: 24-05-2013**

Subject Name: Automobile System Design

Time: 02.30 pm - 05.00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Design a centrifugal clutch to transmit 18.5 kW at 720 r.p.m. consists of four shoes. The clutch is to be engaged at 75% of the running speed. The inner radius of the drum is 165 mm, while the radius to the centre of gravity of the shoe, when the clutch is engaged, is 140 mm. The coefficient of friction is 0.25. Pressure on the each shoe is 0.1 MPa and angle subtended by the arc of contact of the shoe at the centre of spider is 60°. **08**

(b) Explain air brake system with line diagram. **06**

Q.2 **(a)** Determine the maximum shaft diameter for an automobile engine developing 30 kW at 1500 r.p.m. The bottom gear ratio of gear box is 3.8. Effective wheel diameter is 0.65 m and the coefficient of friction between the tyre and the road surface is 0.6. The permissible shear stress is 32 N/mm^2. Calculate the maximum load permissible on each wheel. **08**

(b) Explain design considerations while designing a disc clutch. **06**

OR

(b) Write short note on disc brake. **06**

Q.3 **(a)** A semi-elliptic leaf spring used for an automobile suspension consists of two extra full length leaves and 12 graduated length leaves, including the master leaf. The centre to centre distance between the two eyes of the spring is 1.2 m. The maximum force acting on the spring is 50 kN and the ratio of width to thickness for each leaf is 8:1. The modulus of elasticity of the leaf spring is 210 GPa. The leaves are pre-stressed in such a way that when the force is maximum, the stresses induced in all leaves are 500 N/mm^2. Determine: **08**

1. The width and thickness of the leaves
2. The initial nip
3. Deflection of spring at maximum load
4. The load exerted on the band after the spring is assembled.

(b) Explain (1) braking efficiency (2) stopping distance **06**

OR

Q.3 **(a)** Design a close coiled helical compression spring for a service load ranging from 2000 N to 2500 N. The axial deflection of spring for the load range is 6 mm. Assume a spring index of 5. The permissible shear stress intensity is 400 MPa and modulus of rigidity, G = 84 kN/mm^2. Neglect the effect of stress concentration. **08**

(b) Discuss Ackermann steering mechanism. **06**

Q.4 **(a)** A car has pivot pins 114 cm apart, the length of each track arm is 15.25 **08**

cm and the track rod behind the axle is 104 cm long. Determine the wheel base for true rolling of all wheels when the inner wheel stub axle is at 55° to the centre line of the car.

(b) With the help of sketch describe the construction of leaf spring. **06**

OR

Q.4 **(a)** A motor car has a wheel base of 264 cm, the height of its C.G. above the ground is 0.61 m and it is 112 cm in front of the rear axle if the car is travelling at 40 km/hr. on a level track, determine the minimum distance in which the car may be stopped, when, **08**

(1) the front wheels are braked
(2) the rear wheels are braked
(3) all wheels are braked

(b) Explain vehicle testing on chassis dynamometer. **06**

Q.5 **(a)** Write short note on anti-lock braking system. **07**

(b) List the various types of steering gear and explain worm and wheel steering gear. **07**

OR

Q.5 **(a)** Write short note on universal joint and slip joint. **07**

(b) Explain pneumatic suspension system. **07**

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