Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– 7th • EXAMINATION – SUMMER 2015

Subject Code: 170202 **Date:08/05/2015**

Subject Name: Automobile System Design

Time: 02.30PM-05.00PM **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)** Write a note on **07**

(i) Difference between single and multi plate clutch

(ii) Properties of clutch fluid

(b) Describe with schematic diagram Anti-Lock Braking system of Modern Vehicle **07**

Q.2 **(a)** A single plate clutch, effective on both sides, is required to transmit 25 kW at 3000 r.p.m. Determine the outer and inner diameters of frictional surface if the coefficient of friction is 0.255, ratio of diameters is 1.25 and the maximum pressure is not to exceed 0.1 N/mm^2 . Also determine the axial thrust to be provided by springs. Assume the theory of uniform wear. **07**

(b) What do you mean by Braking efficiency of vehicle? Write a short note on Vehicle testing on chassis dynamometer **07**

OR

(b) Design a helical compression spring for a maximum load of 1000 N for a deflection of 25 mm using the value of spring index as 5. **07**

The maximum permissible shear stress for spring wire is 420 MPa and modulus of rigidity is 84 kN/mm^2.

Take Wahl's factor, $K = \frac{4C-1}{4C-4} + \frac{0.615}{C}$

where C = Spring index.

Q.3 **(a)** An automobile engine develops 28 kW at 1500 rpm and its bottom gear ratio is 3.06 .If propeller shaft of 40 mm outside diameter is to be used determine the inside diameter is mild steel to be used , assuming a safe shear stress of 55000 kPa for the MS. **07**

(b) Name different types of Steering gearbox used in automobile. Explain any two with neat sketch stating its merit and limitations. **07**

OR

Q.3 **(a)** Explain different types of axles used in automobile. Give Function of Differential used in automobile. **07**

(b) A motor car has a wheel base of 2.64 m, the height of its CG above the ground is 0.61 m and it is 1.12 m in front of the rear axles. If the car is travelling at 40 km/h on a level track, determine the minimum stopping distance in which the car may be stopped . Take μ =0.6 **07**

when

a) The rear wheels are braked

b) The front wheels are braked

c) All four wheels are braked.

Q.4	**(a)**	Motor vehicle has a wheel base of 2.743 m and pivot center of 1.065 m. The Front and Rear wheel track is 1.217 m. Calculate the correct angle of outside lock and turning circle radius of the outer front and inner rear wheels when the angle of inside lock is 40^0.	**07**
	(b)	Explain Independent suspension of automobile	**07**
		OR	
Q.4	**(a)**	Explain Johnson's method of optimum design with suitable example.	**07**
	(b)	Explain step by step design procedure for Leaf springs.	**07**
Q.5	**(a)**	Write descriptive notes on the following: 1) Slip Joint 2) Constant velocity universal joints	**07**
	(b)	Explain Internal Expanding shoe brake & Disk brake with neat sketch.	**07**
		OR	
Q.5	**(a)**	In a hydraulic single line braking system force on foot-pedal is 100 N. Pedal leverage ratio is 4 ,Cross sectional area of master cylinder is 4 cm^2 ,cross sectional area of front piston 20 cm^2 ,cross sectional area of rear piston 5 cm^2 and distance moved by effort is 1 cm calculate (i) Front to rear brake ratio (ii) % of front and rear braking (iii) Total force ratio (iv) Distance moved by output (v) Cylinder movement ratio (vi) Total movement ratio	**07**
	(b)	Write a short note on (i) Maximum speed & acceleration relation of vehicle. (ii) Durability and reliability of vehicle.	**07**

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