Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII EXAMINATION – SUMMER 2016

Subject Code:170202 **Date:07/05/2016**

Subject Name:Automobile System Design

Time:02:30 PM to 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)** Describe with schematic diagram hydraulic braking system. **07**

(b) An automobile engine develops 28 kW at 1500 rpm and its bottom gear ratio is 3.06. if a propeller shaft of 40mm outside diameter is to be used, determine the inside diameter of mild steel tube to be used, assuming a safe shear stress of
55×10^3 kPa for MS. **07**

Q.2 **(a)** A centrifugal clutch consists of four shoes, each having a mass of 1.5 Kg. In the engaged position, the radius to the center of gravity of each shoe is 110 mm, while the inner radius of drum is 140 mm. the coefficient of friction is 0.3. The pre load in spring is adjusted in such a way that the spring force at beginning of engagement is 700N. The running speed is 1440 rpm. calculate **07**

(1) The speed at which the engagement begins and
(2) The power transmitted by the clutch at 1440 rpm.

(b) Which are the two theories applied to friction plates? Explain any one. **07**

OR

(b) Compare Disc type brake with Drum type of brake. **07**

Q.3 **(a)** Explain with neat sketch telescopic type suspension system. **07**

(b) Design a helical compression spring for a maximum load of 1000N for a deflection of 25 mm using the value of spring index as 5. The maximum permissible shear stress for spring wire is 420MPa and modulus of rigidity is 84 kN/mm^2.Take Wahl's factor K=1.31 **07**

OR

Q.3 **(a)** What is the function of universal joints? Where are the universal joints used in automobile? List down the different types of universal joints and draw schematic diagram only. **07**

(b) Explain in detail the function and construction with sketches of a leaf spring and how it is mounted on rear and front in vehicle. **07**

Q.4 **(a)** The coefficient of rolling resistance for a truck weighing 62293.5N is 0.018 and the coefficient of air resistance is 0.0276 in the formula $R=KW+K_aAV^2$, N, where A is m^2 of frontal area and V the speed in Km/h. The transmission efficiency in top gear of 6.2:1 is 90% and that in second gear of 15:1 is 80%. The frontal area is 5.574 m^2. If the truck has to have maximum speed of 88Km/h in top gear calculate **07**

(1) The engine brake power required;
(2) The engine speed if the driving wheels have an effective diameter of 0.8125 m;
(3) Maximum grade the truck can negotiate at the above engine speed in second gear.

(b) Explain the term (1) rolling resistance (2) Air resistance **07**

OR

Q.4	**(a)**	Explain how this two test are carried out in test laboratory (1) Braking test (2) suspension test.	**07**
	(b)	Give list of different types of gear box used in heavy vehicles in automobile. And explain any one.	**07**
Q.5	**(a)**	A track has pivot pins 1.37 m apart, the length of each track arm is 0.17 m and the track rod is behind front axle and 1.17 m long. Determine the wheel base which will give true rolling for all wheels when the car is turning so that the inner wheel stub axle is 60° to the center line of the car. A geometrical construction may be used.	**07**
	(b)	Write short note on hydraulic operated steering system.	**07**

OR

Q.5	**(a)**	Explain design procedure for internal expanding shoe brake.	**07**
	(b)	Explain step by step johnson's method of optimum design.	**07**

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