

GUJARAT TECHNOLOGICAL UNIVERSITY

BE – SEMESTER – VIII (NEW) EXAMINATION- SUMMER 2020

Subject Code: 2180206

Date: 26/10/2020

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.

		MARKS
Q.1	(a) What is a self – energizing brake? When a brake becomes self-locking?	03
	(b) Explain the uniform pressure theory while designing the single plate clutch.	04
	(c) A single plate clutch, consisting of two pairs of contacting surfaces, is required to transmit 40 kW power at 1560 r.p.m. The outer diameter of the friction disk is limited to 300 mm. The coefficient of friction between the contacting surfaces is 0.3 and the intensity of pressure is limited to 0.4 N/mm ² . Assume uniform wear condition and service factor is 1.25, Determine: (i) The inner diameter of friction disk, (ii) Axial force required to engage the clutch.	07
Q.2	(a) Explain design considerations for the clutch.	03
	(b) Write short note on disc brake and on drum brake.	04
	(c) Explain pneumatic suspension system and telescopic type shock absorber.	07
	OR	
	(c) The following data is given for a caliper disk brake with annular pad for the front wheels of sports car. 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.	07
Q.3	(a) Write down the characteristics of brake lining materials.	03
	(b) Describe with the help of suitable sketches the construction and working of a Torsion Bar Suspension system	04
	(c) 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. 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.	07
	OR	
Q.3	(a) Why the clutches are usually design on the basis of Uniform Wear theory? Write down equation of torque transmitting capacity basis on uniform wear theory.	03
	(b) Write the advantages and disadvantages of Independent suspension system	04
	(c) A typical coil suspension spring has 10 effective coils of a mean diameter 125 mm and made out of wires of diameter 15 mm. The spring is designed to carry a maximum static load of 3531.6 N. Calculate the shear stress and the deflection under the above loading. If a maximum shear stress of 637650 kPa	07

is allowable in the material, then what is the possible clearance in the spring?
Take the value of $G = 73575 \times 10^3 \text{ kPa}$.

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- Q.4** (a) List the various types of universal joints and explain any one **03**
(b) Explain different types of axles used in automobile. **04**
(c) Name different types of Steering gearbox used in automobile. Explain any two with neat sketch stating its merit and limitations. **07**

OR

- Q.4** (a) Explain the working of hydraulic clutch system. **03**
(b) Explain with neat sketch Power Steering of Today's automobile. **04**
(c) An automobile engine develops 28 kW at 1500 rpm and its bottom gear ratio is 3.06. If a propeller shaft of 40 mm outside diameter is to be used, determine the inside diameter of mild steel tube to be used, assuming a safe stress of $55 \times 10^3 \text{ kPa}$ for the mild steel. **07**

- Q.5** (a) Why the wheel alignment is required in vehicle? **03**
(b) Explain (1) braking efficiency (2) stopping distance **04**
(c) Explain Johnson's method of optimum design. **07**

OR

- Q.5** (a) Explain a brief note on leaf spring with suitable sketch. **03**
(b) Explain Anti-lock braking system **04**
(c) Explain: Camber, Caster, Toe-in, Toe-out and King Pin Inclination with figure. **07**

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