Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (NEW) EXAMINATION – WINTER 2023

Subject Code:3170202 Date:12-12-2023

Subject Name: Automotive Component and system Design

Time: 10:30 AM TO 01:30 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**
5. **Use of design data book is permissible**

			Marks
Q.1	**(a)**	What are the advantages and disadvantages of "Wet Liner" and "Dry Liner" in I.C Engines?	**03**
	(b)	What do you mean by standardization? Describe its significance and explain role of preferred numbers in standardization	**04**
	(c)	Explain synchromesh Gear box with neat sketch.	**07**
Q.2	**(a)**	Explain lubrication and mounting/dismounting of bearings?	**03**
	(b)	Explain the importance of manufacturing considerations in machine design?	**04**
	(c)	Select a single row deep groove ball bearing for a radial load of 4000 N and an axial load of 5000 N, operating at a speed of 1600 r.p.m. for an average life of 5 years at 10 hours per day. Assume uniform and steady load.	**07**
		OR	
	(c)	A shaft rotating at constant speed is subjected to variable load. The bearings supporting the shaft are subjected to stationary equivalent radial load of 3 kN for 10 per cent of time, 2 kN for 20 per cent of time, 1 kN for 30 per cent of time and no load for remaining time of cycle. If the total life expected for the bearing is 2000000 revolutions at 95 per cent reliability, calculate dynamic load rating of the ball bearing.	**07**
Q.3	**(a)**	Explain the design of torsion bar spring.	**03**
	(b)	Give list of different types of gearbox used in vehicle. Explain any one in detail with sketch.	**04**
	(c)	A bronze spur pinion rotating at 600 r.p.m. drives a cast iron spur gear at a transmission ratio of 4 : 1. The allowable static stresses for the bronze pinion and cast iron gear are 84 MPa and 105 MPa respectively. The pinion has 16 standard 20° full depth involute teeth of module 8 mm. The face width of both the gears is 90 mm. Find the power that can be transmitted from the standpoint of strength	**07**
		OR	
Q.3	**(a)**	Explain the rack and pinion steering gear mechanism with neat sketch	**03**
	(b)	Explain Independent suspension of automobile	**04**
	(c)	A pair of helical gears are to transmit 15 kW. The teeth are 20° stub in diametral plane and have a helix angle of 45°. The pinion runs at 10 000 r.p.m. and has 80 mm pitch diameter. The gear has 320 mm pitch diameter. If the gears are made of cast steel having allowable static strength of 100 MPa; determine a suitable module and face width from static strength considerations and check the gears for wear, given σ_{es} = 618 MPa.	**07**

Q.4	**(a)**	Sketch a valve gear mechanism, name different parts in it and list materials of valve androcker arm	**03**
	(b)	Explain: Camber, Caster, Toe-in, Toe-out and King Pin Inclination with figure.	**04**
	(c)	Explain terminology of bevel gears with neat sketch.	**07**

OR

Q.4	**(a)**	What are the advantages of helical gears over spur gears?	**03**
	(b)	Explain Anti-lock braking system	**04**
	(c)	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 when a) The rear wheels are braked b) The front wheels are braked c) All four wheels are braked.	**07**

Q.5	**(a)**	Neatly sketch and label the Master cylinder	**03**
	(b)	Explain the following terms in relation with rolling contact bearings: 1)Static load capacity, 2) Dynamic load capacity	**04**
	(c)	Explain the Design of Piston with neat sketch.	**07**

OR

Q.5	**(a)**	What is the function of Gear box in automobile?	**03**
	(b)	Explain the following terms in relation with rolling contact bearing 1)Equivalent load 2)Bearing life	**04**
	(c)	A track has pivot pins 1.37m apart, the length of each track arm is 0.17m 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 600 to the center line of the car. A geometrical construction may be used	**07**

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