Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (NEW) EXAMINATION – SUMMER 2024

Subject Code:3170202 Date:24-05-2024

Subject Name:Automotive Component and system Design

Time:02:30 PM TO 05:30 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.**

			MARKS
Q.1	**(a)**	What are preferred numbers?	**03**
	(b)	Explain the importance of manufacturing considerations in machine design.	**04**
	(c)	Derive Stribeck's equation.	**07**
Q.2	**(a)**	What are the advantages of using oil instead of grease in bearings?	**03**
	(b)	What is preloading of the rolling contact bearing? Why it is necessary?	**04**
	(c)	Explain the types of rolling contact bearing with its application and necessary figure.	**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 percent of time, 2 kN for 20 per cent of time, 1 kN for 30 percent of time and no load for remaining time of cycle. If the total life expected for the bearing is 20×10^6 revolutions at 95 percent reliability, calculate dynamic load rating of the ball bearing.	**07**
Q.3	**(a)**	State different modes of gear teeth failures.	**03**
	(b)	Define following terms (1) Pitch circle (2) Pressure angle (3) Module (4) Addendum.	**04**
	(c)	A helical cast steel gear with 30° helix angle has to transmit 35 kW at 1500 rpm. If the gear has 24 teeth, determine the necessary module, pitch diameter and face width for 20° full depth teeth. The static stress for cast steel may be taken as 56 MPa. The width of the face may be taken as 3 times the normal pitch. What would be the end thrust on the gear? The tooth factor for 20° full depth involute gear may be taken as $0.154 - \left(\frac{0.912}{T_E}\right)$, where T_E represent the equivalent number of teeth.	**07**
		OR	
Q.3	**(a)**	Why I section is more preferred for connecting rod?	**03**
	(b)	Explain the types of Cylinder liners.	**04**
	(c)	The cylinder of a four-stroke diesel engine has the following specification. Brake power =5 kW, Speed =1200 rpm, Indicated mean effective pressure =0.35 MPa, Mechanical efficiency =80%, Max. Gas pressure =3.15 MPa. Calculate (i) Bore and length of the cylinder liner, (ii) Thickness of the cylinder head, (ii) Size, number and pitch of studs.	**07**

Q.4	**(a)**	Write the advantages of Synchromesh gearbox.	**03**
	(b)	Explain the function of differential drive.	**04**
	(c)	Design a 3 speed constant mesh gearbox having a gear ratio of 3.6 in bottom and reverse gear. The main shaft and lay shaft are 12 cm apart approximately. Take the module 3.25 mm. the top gear has got unity gear ratio. Find the exact gear ratio.	**07**

OR

Q.4	**(a)**	Define Chassis and Give its classification.	**03**
	(b)	Compare Disc Brake with Drum Brake.	**04**
	(c)	Explain with neat sketch Power Steering of Today's automobile.	**07**

Q.5	**(a)**	Write the function of Torsional Spring.	**03**
	(b)	Differentiate between Cross Ply and Radial Ply Tyres.	**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 where C = Spring index.	**07**

OR

Q.5	**(a)**	Define: Camber, Caster and Toe In-Toe Out.	**03**
	(b)	Explain telescopic type shock absorber.	**04**
	(c)	A vehicle with wheel base 2.14 m and front wheel track 1.00 m is provided with Ackermann steering system. The distance from the center plane of each front wheel to the nearest king pin axis is 0.11 m. while taking a turn; the inner front wheel is deflected through a maximum angle of 42°. Calculate the corresponding deflection of the outer front wheel, assuming that all the wheels are in true rolling motion. Also, find the turning radius of the outer front wheel and inner rear wheel	**07**

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