GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–VII (NEW) EXAMINATION – WINTER 2022

Subject Code:3170202   **Date:03-01-2023**
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 Design Data Book wherever necessary.**

			MARKS

Q.1 **(a)** Explain Standardization.   **03**
      (b) What are preferred numbers? Explain its importance.   **04**
      (c) State and explain design consideration of casting.   **07**

Q.2 **(a)** Explain the situations, where creep is a serious problem.   **03**
      (b) Explain the importance of manufacturing considerations in machine   **04**
            design.
      (c) Derive Stribeck's equation.   **07**

OR

      (c) Explain the types of rolling contact bearing with its application and necessary   **07**
            figure.

Q.3 **(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) A shaft rotating at constant speed is subjected to variable load. The   **07**
            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.

OR

Q.3 **(a)** State different modes of gear teeth failures.   **03**
      (b) Define following terms (1) Pitch circle (2) Pressure angle (3) Module   **04**
            (4) Addendum.
      (c) A helical cast steel gear with 30° helix angle has to transmit 35 kW at   **07**
            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.

Q.4 **(a)** Write the advantages and disadvantages of gear drive compared to other   **03**
            power transmission devices.
      (b) State the law of gearing and explain it.   **04**
      (c) Explain with neat sketch Power Steering of Today's automobile.   **07**

OR

Q.4 **(a)** Explain Leaf Spring.   **03**

	(b)	What is tractive effort? Explain it.	**04**
	(c)	Explain with neat sketch the telescopic type suspension system.	**07**

Q.5 (a) Why I section is more preferred for connecting rod?   **03**

(b) Compare Disc Brake with Drum Brake.   **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 =0.35MPa, Mechanical efficiency =80%, Max. gas pressure =3.15 MPa. Calculate i. Bore and length of the cylinder liner, ii. Thickness of the cylinder head, iii. Size, number and pitch of studs.   **07**

OR

Q.5 (a) State the function of following for an I C Engine piston: **03**
1. Piston rings, 2. Piston skirts, 3. Piston pin.

(b) What are the advantages and disadvantages of wet liner and Dry liner in IC Engines?   **04**

(c) Design a cast iron piston for a single acting four stroke engine for the following data: Cylinder bore = 100 mm; Stroke = 125 mm; Maximum gas pressure = 5 N/mm^2; Indicated mean effective pressure = 0.75 N/mm^2; Mechanical efficiency = 80%; Fuel consumption = 0.15 kg per brake power per hour; Higher calorific value of fuel = 42×10^3 kJ/kg; Speed = 2000 rpm. Taking Permissible bending or tensile stress for C.I = 38 N/mm^2; C = Constant representing that portion of the heat supplied to the engine which is absorbed by the piston is 0.05. cast iron, Heat conductivity factor k = 46.6 W/m/°C, and Temperature difference at the centre of the piston head and temperature at the edges piston head is = 220°C; Pressure of the gas on cylinder wall is 0.035; Allowable tensile or bending stress for C.I ring is 90 N/mm^2; Bearing pressure on the piston barrel is 0.45 N/mm^2 Bearing pressure at small end of connecting rod is 25 N/mm^2; Bending stress for piston pin is 140 N/mm^2.   **07**

****