Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE – SEMESTER- VII EXAMINATION-SUMMER 2023

Subject Code: 3170202 Date: 27/06/2023

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.**

			MARKS
Q.1	**(a)**	What is preloading of rolling contact bearing?	**03**
	(b)	Explain principal of braking system.	**04**
	(c)	Explain the concept of preferred numbers and series in design. Also give some examples.	**07**
Q.2	**(a)**	What do you mean by standardization?	**03**
	(b)	What do you mean by Dynamic Load Carrying Capacity? Explain it.	**04**
	(c)	Explain Load distribution on balls (Stribeck's equation).	**07**
		OR	
	(c)	Single row deep groove ball bearing is subjected to a radial force of 8 KN and thrust force of 3 KN. The shaft rotates at 1200 rpm. The expected life L_{10h} of the bearing is 2000h.The minimum acceptable diameter of the shaft is 75 mm. Select a suitable ball bearing for this application.	**07**
Q.3	**(a)**	Why I section is more preferred for connecting rod?	**03**
	(b)	A Tapper roller bearing has a dynamic load capacity of 26 KN. The desired life for 90% of the bearing is 8000 hrs and the speed is 300 rpm. Calculate the equivalent radial load that the bearing can carry.	**04**
	(c)	Derive 'Lewis equation' for the beam strength of gear tooth.	**07**
		OR	
Q.3	**(a)**	Write advantages and disadvantages of worm gears.	**03**
	(b)	Derive the expression for beam strength of a spur gear tooth.	**04**
	(c)	A bronze spur pinion rotating at 600 rpm. drives a cast iron spur geat at a transmission ratio of 4:1. The allowable static stress 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**
Q.4	**(a)**	Explain mechanical efficiency in brief.	**03**
	(b)	What are the functions of piston rings?	**04**

(c) A pair of helical gear are to transmit 15 KW the teeth are 20° stub in diameter plane have a helix angle of 45°. The Piston runs at 10000 rpm and has 80 mm pitch diameter. The gear has 320 mm pitch diameter. If the gears are made of cast steel having allowable statistics trace strength of 100 Mpa. Determine the suitable module and face with of static strength considerations. Maximum face width for helical gears is 12.5 m. **07**

OR

Q.4 **(a)** What are the desirable properties of cylinder materials? **03**

(b) What is Gear shifting mechanism? Explain in brief. **04**

(c) A four stroke IC engine has the following specification. **07**
Break power = 7.5 KW Speed = 1000 rpm
Indicated main effective pressure = 0.35 N/ mm^2
Maximum gas pressure = 3.5 N/ mm^2 mechanical efficiency = 80 %
Determine

(1) Dimension of the cylinder if the length of stroke is 1.4 Times the bore of the cylinder.
(2) Wall thickness of the cylinder if the hoop stress is 35 MPa, Allowance for reboring is 8
(3) Thickness of the cylinder head and the size of the stud when the permissible stress for the cylinder head and stud material are 45 MPa and 65 MPa respectively.

Q.5 **(a)** What is function of steering knuckle? **03**

(b) Give the detailed classification of the gearboxes. **04**

(c) Sketch a valve gear mechanism, name different parts in it and list materials of Valve and rocker arm. **07**

OR

Q.5 **(a)** What are the design consideration for a Piston? **03**

(b) What is tractive effort? Explain it. **04**

(c) Design Piston head , Piston Skirt and Piston Pin for the cast iron piston of a single acting four stroke engine from the following data: **07**
Cylinder bore: 100 mm ; Stroke: 125 mm ; Mechanical efficiency = 80%
Maximum gas pressure: 5 N/mm^2 ; Speed: 2000 rpm
Indicated mean effective pressure = 0.75 N/mm^2
Fuel consumption : 0.15 kg/BP/hr ;
Permissible tensile stress for piston : 38 MPa
Higher calorific value of fuel : $42*10^3$ kj/kg
Thermal conductivity : 46.6 W/m/ºC
Temperature difference : 220 ºC
Cylinder wall pressure : 0.035 N/mm^2
Bearing pressure on piston barrel : 0.45 N/mm^2
Bearing pressure at small end : 25 N/mm^2
Length of Ring Section: 21 mm

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