Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (NEW) EXAMINATION – SUMMER 2022

Subject Code:3170202 Date:01/06/2022

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 do you mean by standardization? Describe its significance	**03**
	(b)	Explain the design for manufacturing and design for assembly	**04**
	(c)	Explain the concept of preferred numbers and series in design. Also give some examples.	**07**
Q.2	**(a)**	What is preloading of rolling contact bearing? Why it is necessary	**03**
	(b)	What is Stribeck's equation? Mention the assumptions made for its derivation	**04**
	(c)	The rolling contact ballbearing are to be selected to support theoverhung countershaft. The shaft speed is720 r.p.m. The bearings are to have 99%reliability corresponding to a life of 24 000hours. The bearing is subjected to anequivalent radial load of 1 kN. Consider lifeadjustment factors for operating conditionand material as 0.9 and 0.85 respectively.Find the basic dynamic load rating of thebearing from manufacturer's catalogue,specified at 90% reliability.	**07**
		OR	
	(c)	A single row angular contact ball bearing number 310 is used for an axial flowcompressor. The bearing is to carry a radial load of 2500 N and an axial or thrust load of 1500 N.Assuming light shock load, determine the rating life of the bearing.	**07**
Q.3	**(a)**	Explain the following terminologies related with gear i) module ii) circular pitch iii) pressure angle	**03**
	(b)	What is meant by corrosive wear of gear tooth? Mention its causes and remedies	**04**
	(c)	Derive 'Lewis equation' for the beam strength of gear tooth, including the assumptions made	**07**
		OR	
Q.3	**(a)**	Write advantages and disadvantages of worm gears	**03**
	(b)	Why involute profile is preferred for gear tooth?	**04**
	(c)	The following particulars of a single reduction spur gear are given : Gear ratio = 10 : 1; Distance between centres = 660 mm approximately; Pinion transmits 500kW at 1800 r.p.m.; Involute teeth of standard proportions (addendum = m) with pressure angle of 22.5°; Permissible normal pressure between teeth = 175 N per mm of width. Find :	**07**

1. The nearest standard module if no interference is to occur;
2. The number of teeth on each wheel;
3. The necessary width of the pinion; and
4. The load on the bearings of the wheels due to power transmitted.

Q.4	**(a)**	Why I section is more preferred for connecting rod?	**03**
	(b)	Why do inlet and exhaust valves have conical heads and seats?	**04**
	(c)	Design a cast iron piston for a single acting four stroke engine for the followingdata: Cylinder bore = 100 mm ; Stroke = 125 mm ; Maximum gas pressure = 5 N/mm^2 ; Indicatedmean effective pressure = 0.75 N/mm^2 ; Mechanical efficiency = 80% ; Fuel consumption = 0.15 kgper brake power per hour ; Higher calorific value of fuel = 42×10^3 kJ/kg ; Speed = 2000 r.p.m. Any other data required for the design may be assumed.	**07**

OR

Q.4	**(a)**	What are the advantages of using separate cylinder liners	**03**
	(b)	Give the detailed classification of the gearboxes	**04**
	(c)	A four stroke diesel engine has the following specifications : Brake power = 5 kW ; Speed = 1200 r.p.m. ; Indicated mean effective pressure = 0.35 N /mm^2 ; Mechanical efficiency = 80 %. Determine : 1. bore and length of the cylinder ; 2. thickness of the cylinder head ; and 3. size ofstuds for the cylinder head.	**07**
Q.5	**(a)**	Explain different types of piston rings	**03**
	(b)	Explain brake efficiency	**04**
	(c)	Derive the expression for beam strength of bevel gear	**07**

OR

Q.5	**(a)**	Why the wheel alignment is required in vehicle? Explain the front wheel alignment in vehicle.	**03**
	(b)	Explain synchromesh Gear box with neat sketch	**04**
	(c)	A pair of helical gears is 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 staticstrength of 100 MPa; determine a suitable module and face width from static strength considerationsand check the gears for wear, given σes = 618 MPa.	**07**

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