

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VII (NEW) EXAMINATION – SUMMER 2024****Subject Code:2170202****Date:30-05-2024****Subject Name:Automobile Component 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) Discuss the design considerations for casting.	03
(b) Write a detailed note on selection of gear materials.	04
(c) Derive Stribeck's equation.	07
Q.2 (a) What does antifriction bearing mean? Give its classifications.	03
(b) Why preloading is necessary in cylindrical roller bearing and how this is achieved?	04
(c) Short notes on following: (i) Interference (ii) Backlash (iii) Gear Material.	07
OR	
(c) Explain the concept of preferred numbers and series in design. Also, give some examples.	07
Q.3 (a) Define following terms:	03
1) Circular pitch 2) Face width 3) Module.	
(b) Derive the expression for beam strength of a spur 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 500 kW 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 : 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	07
OR	
Q.3 (a) State different modes of gear teeth failures.	03
(b) State the advantages and disadvantages of worm gears.	04
(c) What is creep? Explain the situations where creep is a serious problem.	07
Q.4 (a) Explain Design Considerations of gearbox.	03
(b) What is tractive effort? Explain it.	04
(c) Explain synchromesh Gearbox with neat sketch.	07
OR	
Q.4 (a) What are the conditions in which nonmetallic gears are preferred?	03
(b) Explain why all standard systems prefer Involute profile for gear tooth.	04
(c) 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	07

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 $\sigma_{es} = 618 \text{ MPa}$.

Q.5 (a) 'It is preferred to provide more number of thin piston rings than small number of thick rings' Justify the statement. **03**

(b) Discuss the design of piston for an internal combustion engine. **04**

(c) Determine the dimensions of cross section of the connecting rod for a diesel engine with the following data: **07**

Cylinder bore=100mm

Length of connecting rod=350mm

Maximum gas pressure=4MPa

Factor of safety =6 , Assume $\sigma_c=330\text{N/mm}^2$, $a=1/7500$

OR

Q.5 (a) What are the advantages of having separate cylinder liner? **03**

(b) Why I section is more preferred for connecting rod? **04**

(c) A four stroke diesel engine has the following specifications : **07**

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 of studs for the cylinder head.

(Any other data required for the design may be assumed.)
