Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE – SEMESTER – VI EXAMINATION – WINTER 2015

Subject Code:160201   **Date:15/12/ 2015**

Subject Name:Automobile Component Design

Time:2:30pm to 5:00pm   **Total Marks: 70**

Instructions:
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	(a)	Explain design considerations for casting and forging.	07
	(b)	Explain types of rolling contact bearing.	07
Q.2	(a)	What do you mean by creep? Explain wear consideration in design.	07
	(b)	The rolling contact ball bearing are to be selected to support the overhung countershaft. The shaft speed is 720 r.p.m The bearings are to have 99% reliability corresponding to a life of 22000 hours. The bearing is subjected to an equivalent radial of 1 kN. Consider life adjustment factors for operation condition and material as 0.9 and 0.85 respectively. Find the basic dynamic load rating of the bearing from manufacturer's catalogue, specified at 90% reliability. (Take b = 1.17 , k = 3)	07

OR

	(b)	Explain balancing of single and multi cylinder engine.	07
Q.3	(a)	Explain design criteria for Intake manifold and selection of engine layout.	07
	(b)	A motor shaft rotating at 1500 r.p.m has to transmit 15 kW to a low speed shaft with a speed reduction of 3 :1 The teeth are $14^1/_2{}^o$ involutes with 25 teeth on the pinion. Module of both pinion and gear is 6 mm. Both are pinion and gear are made of steel with a maximum safe stress of 200 Mpa. A safe stress of 40 Mpa may be taken for the shaft on which the gear is mounted and for the key. Find face width for pinion of spur gear. (take C_s = 1)	07

$$C_v = \frac{3}{3+v} \qquad , \qquad y_p = 0.124 - \frac{0.684}{T_p}$$

OR

Q.3	(a)	Explain the important steps of multi speed automobile gear box design.	07
	(b)	Explain Lead angle, Axial pitch and helix angle for Worm and worm gear.	07
Q.4	(a)	What are the advantages and disadvantages of "Wet Liner" and "Dry Liner" in I.C. engines? What are the desirable properties of cylinder materials?	07
	(b)	A 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 10000 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 static strength of 100 MPa ; determine a suitable module and face width from static strength consideration and check the gears for wear , given σ_{es} = 618 MPa. (b = 12.5 mm)	07

Take E_P = E_G = 200 kN / mm^2

$y_p = 0.175 - \frac{0.841}{T_E}$, $C_v = \frac{0.75}{0.75+ \sqrt{v}}$,

OR

Q.4 (a) Explain design of piston with neat sketch. 07
     (b) Explain beam strength and wear strength for bevel gear. 07

Q.5 (a) Explain Design procedure for connecting road. 07
     (b) Explain design procedure for rocker arm with neat sketch. 07

OR

Q.5 (a) The bore of a cylinder of the four stroke diesel engine is 150 mm. The 07
       maximum gas pressure inside the cylinder is limited to 3.5 MPa. The
       cylinder head is made of grey cast iron FG200 ($S_{ut} = 200$ N/mm^2) and the
       factor of safety is 5. Determine thickness of cylinder head. (Take K =
       0.162)

       Studs are used to fix the cylinder head to the cylinder and obtain a
       leakproof joint. They are made of steel feE 250 ($S_{yt} = 250$ N/mm^2) and
       fector of safety is 5.
       Calculate (i) number of studs (ii) nominal diameter of studs (iii) pitch of
       studs.

     (b) What is the difference between centre and overhung crankshafts? Where do 07
       you use them? Name the materials for crankshaft.

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