GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–VIII EXAMINATION – WINTER 2015

Subject Code: 181902   **Date:04/12/2015**
Subject Name: Machine Design - II
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)**	What is pitting and scoring? Explain the different causes of gear tooth failure and suggest possible remedies to avoid such failures.	**07**
	(b)	A stock helical gear has normal pressure angle of 20°, a helix angle of 25°, and a transverse diametral pitch of 6 teeth / in, and has 18 teeth. find :	**07**

      a) The pitch diameter
      b) The transverse, the normal and axial pitches
      c) The normal diametral pitch
      d) The transverse pressure angle.

Q.2	**(a)**	Why the efficiency of warm gear drive is low? Explain.	**04**
	(b)	Draw the ray and speed diagram for a nine speed gear box if the transmission range ration violation does not occur with the preferred structure equation. z = 3(1)3(3)	**10**

OR

	(b)	Draw the structure and speed diagram for a gear box having operating speed range from 56 rpm to 1000 rpm. Use R4 series, with standard spindle speed. The gear box is connected to a motor driven by a pair of pulleys. Assume the motor speed to be 1440 rpm. Draw the gear box layout diagram.	**10**

Q.3	**(a)**	Draw a neat sketch of the connecting rod and explain its constructional detail.	**04**
	(b)	A two stroke engine is to be design for a brake power of 7 kw at a speed of 800 rpm. The indicated mean effective pressure may be assumed as 0.5 Mpa. Design:	**10**

      1) The bore and length of the cylinder liner
      2) The thickness of the liner
      3) The cylinder head thickness
      4) The size, number and pitch of studs.

Also calculate the apparent and net stresses in the liner, if Poisson's ratio is 0.25, Mechanical efficiency is 0.8 , Ultimate strength of liner is 250 N/mm^2 , Ultimate tensile strength of cylinder head is 240 N/mm^2, The studs are made from FeE280 and its S_{yt} = 280 N/mm^2, and factor of safety is 5. Take suitable assumption if necessary.

OR

Q.3	**(a)**	What are the design requirements of Piston in engine? Explain.	**04**

(b) A four stroke diesel engine has the following specification: **10**

Cylinder bore	= 200 mm
Stroke	= 240 mm
Speed	= 850 rpm
Indicated mean effective pressure	= 0.5 Mpa
Mechanical efficiency	= 80%
Maximum gas pressure	= 5 Mpa
Fuel consumption	= 0.27 kg per BP per hour
Higher calorific value of fuel	= 47000 kJ/kg

Assume that 5% of the total heat developed in the cylinder is transmitted by the piston. The piston is made from gray cast iron FG240 having S_{ut}= 240 Mpa and thermal conductivity factor of 46.6 W/m/°C. Assume a factor of safety as 5. The temperature difference between the center and the edge of the piston head is 220 °C. Calculate the thickness of the piston head.
Suggest if the piston requires the presence of ribs. If so, suggest the number of ribs and their thickness. Also state whether a cup is required on the piston head and if so, what would be its radius.

Q.4 **(a)** Why trapezoidal section is used in hook? Draw net sketch of single hook and also mention its critical section. **04**

(b) An inclined conveyor handles an ore having a density of 1.5 t/m3. The material has to be conveyed over a distance of 2 kms and a height of 450 m. If the belt speed is to be 120 m/min, then determine the standard width of the four ply belt so that the material can be conveyed at a rate of 3 tonnes/hr. For the inclined belt use the following data for the flow ability factor. **10**

Conveyor Inclination	$10° – 15°$	$16° – 20°$	$21° – 25°$	$26° – 30°$	$31° – 35°$
Flowability Factor, C_1	2.65×10^{-4}	2.50×10^{-4}	2.35×10^{-4}	2.20×10^{-4}	2.05×10^{-4}

Standard belts widths are : 300 ,400 , 450, 500 , 600 , 650, 750 , 800, 900, 1000 , 1200, 1400, 1600 , 1800 , 2000, 2200 , 2400 mm.

Also determine the diameter and width of the drive pulley and the gear reduction ratio for the motor, if the motor speed is 1440 rpm. Assume the material for the ply of the belts has a material factor k_1=2.5 and the belt tension and arc of contact factor, k_2=80. The effective width b (in meter), of the material carried by the belt safety is given by the following equation :
$$b = 0.9 B - 0.05$$
Where B = belt width in m.

OR

Q.4 **(a)** Explain the Classification of material handling equipment's. **04**

(b) Determine the resistance offered by a single carrying and return idler for the conveyor having the following data: **10**
Capacity of the conveyor is 400 tph , Belt speed is 2 m/s , Mass of belt = 16 kg/m , Mass of each idler = 25.1 kg , Carrying side pitch = 1 m , Return side pitch = 2 m ,Coefficient of friction between the idler and the pulley = 0.02 , coefficient of friction between the roller pin and the idler = 0.04 , Ratio of roller pin diameter to idler tube diameter = 0.5 , Belt inclination = 15°.

Q.5 **(a)** What are the basic principles in selecting the type of material handling equipment's? **07**

(b) What is the function of a valve gear mechanism? Explain with neat sketches the valve gear mechanism in case of a vertical and horizontal engine. **07**

OR

Q.5 **(a)** Write basic objectives of material handling system. **07**

(b) Draw a neat diagram of the piston and explain its constructions details. **07**

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