Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VIII • EXAMINATION – SUMMER 2013

Subject Code: 181902 Date: 13/05/2013

Subject Name: Machine Design-II

Time: 10:30 am TO 01:00 pm 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)** Design a spur gear pair from the following given data. **07**

Power to be transmitted = 22.5 kW, Pinion speed = 1450 rpm, Speed reduction = 2.5, No. of teeth on pinion = 20, Service factor = 1.5, b= 10m, Pitch line velocity = 5 m/sec (For initial calculation of module), Maximum permissible error in gear tooth profile = 0.025 mm, k = A factor depending upon the form of teeth = 0.111,Velocity factor = 3/ (3 + V), where V is the pitch line velocity in m/s.

Take endurance surface hardness = 600 MPa

Lewis form factor = 0.154 ï 0.912/No. of teeth for 20^0 pressure angle involute tooth system. The materials and stresses are as under:

Material	[$\mathring{u}_b$]	Elasticity Modulus	Hardness
Pinion (Fe 410)	135 N/mm^2	2.1 x 10^5 N/mm^2	260 BHN
Gear (FG 200)	65 N/mm^2	1.1 x 10^5 N/mm^2	250 BHN

(b) Draw speed ray diagram and layout for a six speed gear box .The out put speed are 160 r.p.m. minimum and 1000 r.p.m. maximum. The motor speed is 1440 r.p.m. **07**

Q.2 **(a)** A pair of helical gears having a transmission ratio 8:3 , with a steady load condition , used for turbine. The maximum speed is 2400 r.p.m. The pinion is to have 27 teeth and a face width of 100 mm. The circular module is 6 mm. The material used for gears is heat treated steel with 250 BHN and have static stress of 210 MPa. The gears are carefully cut. Calculate value of dynamic load and wear load. **07**

(b) Determine the power capacity of a pair of helical turning gears having a transmission ratio of 10:1. The teeth are 20^o full depth involute ï 6 mm module . The pinion has 25 teeth and rotates at 5000 r.p.m. The active face width is 76 mm and material is C-40 steel untreated. **07**

OR

(b) Two shafts at right to each other are connected by a bevel pair having full depth involute teeth. The pinion having 20 teeth transmits 40 kW at 750 rpm to gear shaft running at 375 rpm. Take allowable static stress for pinion and gear materials 100 N/mm^2 and 70 N/mm^2 respectively. Determine module, pitch diameters and face width . **07**

Q.3 **(a)** Explain the different causes of gear tooth failures and suggest possible remedies to avoid such failures. **05**

(b) A speed reducer unit is to be designed for an input of 1.1 kW with transmission ratio 27. The speed of hardened steel worm is 1440 rpm. The worm wheel is to made from phosphor bronze. The tooth form is to be 200 involute . Take center distance between worm and worm wheel = x = 100 mm. Pitch circle diameter of worm = $\frac{x^{0.875}}{1.416}$, worm is double start. **09**

$C_v = \frac{6}{6 + v}$

Form factor y =0.154 ï $\frac{0.912}{T}$

Allowable stress for phosphor bronze = 84 MPa, flexural endurance limit for phosphor bronze = 168 MPa, load stress factor = k = 0.55,

check for (1)Tangential load- power transmitted due to tangential load, (2) Dynamic load ,(3) Static load or endurance strength , (4) Wear load ,(5) Heat dissipation.

OR

Q.3 Design & draw a 2 stage spur gear reduction gear box pairs for operating a set of two belt conveyor for following data: **14**

- Maximum conveyor speed = 1.5 m/s
- Effective diameter of driving pulley of conveyor = 250 mm
- Amount of torque transmitted by each driving pulley of conveyor = 200 Nm.
- Speed of input shaft = 1920 rpm.

Use data design book.

Q.4 **(a)** Determine the principle dimensions of cylinder for a vertical 4 stroke compression ignition engine from the following data: Brake power = 4.5 kW, Speed = 1200 rpm, Indicated mean effective pressure = 0.35 MPa, Mechanical efficiency = 80%. **09**

(b) Describe the criteria for deciding the size of suction and exhaust valve of an I.C. engine. **05**

OR

Q.4 **(a)** Design a connecting rod for a high speed diesel engine from the following data: **09**

Cylinder bore = 100 mm,Stroke = 120 mm,Maximum speed = 1800 rpm,Compression ratio = 18,Max. Explosion pressure = 5 MPa,Mass of reciprocating parts = 3.5 Kg, Length of connecting rod = 240 mm, If the connecting rod is made of drop forged steel, determine the size of I-section, size of small end bearing, big end bearing and bolts. Assume suitable stresses.

(b) 1)Why an I-section is usually preferred to round section in case of connecting rods? **05**

2) What are the merits and demerits of wet and dry cylinder liners?

Q.5 **(a)** The following data refers to a flat belt conveyor for transporting crushed rock , **07**

Mass density =2 tons/m^3 , belt speed =1.5 m/s , belt width(B) =.8m, surcharge angle =25º , effective width of the material carried by the belt safely=b=(0.9B - 0.05).

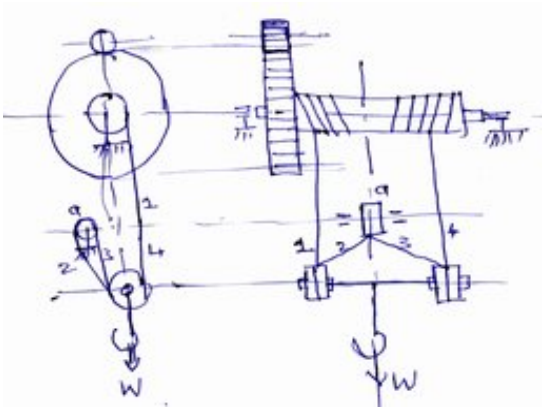
(b) With neat sketches, explain the different types of idler used in conveyors. **07**

OR

Q.5 **(a)** Select the ropes, pulleys and drum for an over head travelling crane with a lifting magnet. **10**

Lifting capacity = 4500 kg (mass),Weight of lifting magnet = 210 kg (mass),Weight of lifting tackle = 110 kg (mass),

Lifting height = 8.5 m, No. of rope parts = 4.



(b) Differentiate between screw conveyor and vibtratory conveyor. **04**

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