Total No. of Questions : 4]

SEAT No. :

PB-165

[Total No. of Pages : 3

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T.E. (Mechanical) (Insem)

DESIGN OF TRANSMISSION SYSTEMS

(2019 Pattern) (Semester - II) (302051)

Time : 1 Hour] *[Max. Marks : 30*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data wherever necessary.***

Q1) a) Explain the term effective load with reference to spur gear. **[6]**

b) The following data is given for a pair of spur gears with 20° full-depth involute teeth: **[9]**

number of teeth on pinion = 24

number of teeth on gear = 56

speed of pinion = 1200 rpm

module = 3 mm

service factor = 1.5

face width = 30 mm; Cv=3/(3+V)

350 BHN

Both gears are made of steel with an ultimate tensile strength of. 600 N/mm^2. Using the velocity factor to account for the dynamic load, calculate :

i) Beam strength;

ii) Wear Strength; and

iii) Rated power that the gears can transmit, if the factor of safety is 1.5.

OR

P.T.O.

Q2) a) Derive an expression for formative number of teeth in helical gears? **[6]**

b) A helical gear pair of 200 full-depth tooth profile consists of 18 teeth pinion meshing with 36 teeth gear. The pinion and gear are made of steel with Sut = 600 N/mm^2. The normal module is 5 mm, face width is 10 times module and surface hardness for gear and pinion is 280 BHN. The helix angle is 23° and pinion speed is 1440 r.pm. If the required factor of safety is 2, calculate **[9]**

i) Beam strength;

ii) Wear strength;

iii) Power transmitting capacity.

Take

$$Cv = \frac{5.6}{5.6 + \sqrt{V}}$$

Q3) a) Derive an expression for virtual number of teeth for Bevel Gears? **[6]**

b) A pair of straight bevel gears is mounted on shafts, which are intersecting at right angles. The number of teeth on the pinion and gear are 21 and 28 respectively. The pressure angle is 20°. The pinion shaft is connected to an electric motor developing 5 kW rated power at 1440 rpm. The service factor can be taken as 1.5. The pinion and the gear are made of steel (Sut = 750 N/mm^2) and heat-treated to a surface hardness of 380 BHN. Lewis form factor is consider as 0.345. Dynamic load by Buckingham's equation is consider as 2166.84 N. The module and face width are 4 mm and 20 mm respectively. Determine factor of safety against bending as well as against pitting failure. **[9]**

OR

Q4) a) Explain the following for Worm gear pair **[6]**

i) Lead,

ii) Diametral quotient,

iii) No. of starts of worm

b) A worm and worm wheel is designated as 2/52/10/4, 10 kw power at 720 rpm supplied to worm shaft. The coefficient of friction is 0.04 and pressure angle is 20°. **[9]**

Determine

i) Tangential component of force;

ii) Axial component of force;

iii) Radial component of force;

iv) FBD of worm and worm wheel for determined component.

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