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Total No. of Pages : 03

Total No. of Questions : 09

B.Tech.(Marine Engg.) (2013 Batch) (Sem.-7)

DESIGN OF MACHINES -II

Subject Code : BTME-601

M.Code : 74250

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A**Q1 Answer briefly :**

- a) Sketch a 6×19 wire rope and name its parts.
- b) List out the dimensionless performance parameters for a hydrodynamic journal bearing.
- c) Distinguish between a self-energizing and self-locking brake.
- d) Define Auto fretting.
- e) State the important reasons for adopting involute curves for a gear tooth profile.
- f) In case of a single plate clutch, six springs are used. Why?
- g) List out the dimensionless performance parameters for a hydrodynamic journal bearing.
- h) A sliding contact bearing is operating under stable condition. The pressure developed in oil film is p when the journal rotates at N r.p.m. the dynamic viscosity of lubricant is μ and effective coefficient of friction between bearing and journal of diameter D is f . Then how f , D and N are related?
- i) In an oil-lubricated journal bearing, coefficient of friction between the journal and the bearing?
- j) State the important reasons for adopting involute curves for a gear tooth profile.

SECTION-B

- Q2 A flat belt is required to transmit 30 kW from a pulley of 1.5 m effective diameter running at 300 r.p.m. The angle of contact is spread over $11/24$ of the circumference. The coefficient of friction between the belt and pulley surface is 0.3. Determine, taking centrifugal tension into account, width of the belt required. It is given that the belt thickness is 9.5 mm, density of its material is 1100 kg / m^3 and the related permissible working stress is 2.5 MPa.
- Q3 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 ; 1 75 N per mm of width. Find:
- a) The nearest standard module if no interference is to occur ;
 - b) The number of teeth on each wheel;
 - c) The necessary width of the pinion; and
 - d) The load on the bearings of the wheels due to power transmitted.
- Q4 A full journal bearing of 50 mm diameter and 100 mm long has a bearing pressure of 1.4 N/mm^2 . The speed of the journal is 900 r.p.m. and the ratio of journal diameter to the diametral clearance is 1000. The bearing is lubricated with oil whose absolute viscosity at the operating temperature of 75°C may be taken as 0.011 kg/m-s . The room temperature is 35°C . find :
- a) The amount of artificial cooling required, and
 - b) The mass of the lubricating oil required, if the difference between the outlet and inlet temperature of the oil is 10°C . Take specific heat of the oil as $1850 \text{ J/ kg/ }^\circ\text{C}$.
- Q5 A multi-disc clutch has three discs on the driving shaft and two on the driven shaft. The inside diameter of the contact surface is 120 mm. The maximum pressure between the surfaces is limited to 0.1 N/mm^2 . Design the clutch for transmitting 25 kW at 1575 r.p.m. Assume uniform wear condition and coefficient of friction as 0.3
- Q6 Explain in detail various design strategies for CAD softwares?

SECTION-C

- Q7 Design a chain drive to actuate a compressor from 15 kW electric motor running at 1000 r.p.m., the compressor speed being 350 r.p.m. The minimum centre distance is 500 mm. The compressor operates 16 hours per day. The chain tension may be adjusted by shifting the motor on slides.

- Q8 A semi-elliptical laminated vehicle spring to carry a load of 6000 N is to consist of seven leaves 65 mm wide, two of the leaves extending the full length of the spring. The spring is to be 1.1 m in length and attached to the axle by two U-bolts 80 mm apart. The bolts hold the central portion of the spring so rigidly that they may be considered equivalent to a band having a width equal to the distance between the bolts. Assume a design stress for spring material as 350 MPa. Determine :
- a) Thickness of leaves.
 - b) Deflection of spring.
 - c) Diameter of eye.
 - d) Length of leaves.
 - e) Radius to which leaves should be initially bent.

The standard thickness of leaves are : 5, 6, 6.5, 7, 7.5, 8, 9, 10, 11 etc. in mm

- Q9 Design a pair of helical gears for transmitting 22 kW. The speed of the driver gear is 1800 *r.p.m.* and that of driven gear is 600 *r.p.m.* The helix angle is 30° and profile is corresponding to 20° full depth system. The driver gear has 24 teeth. Both the gears are made of cast steel with allowable static stress as 50 MPa. Assume the face width parallel to axis as 4 times the circular pitch and the overhang for each gear as 150 mm. The allowable shear stress for the shaft material may be taken as 50 MPa. The form factor may be taken as $y_F = 0.154 - 0.912/T_F$, where T_F is the equivalent number of teeth. The velocity factor may be taken as $350/350 + v$ where v is pitch line velocity in m / min. The gears are required to be designed only against bending failure of the teeth under dynamic condition.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.