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BIME-022

**DIPLOMA – VIEP – MECHANICAL
ENGINEERING (DMEVI)**

Term-End Examination

December, 2015

BIME-022 : POWER TRANSMITTING ELEMENTS

Time : 2 hours

Maximum Marks : 70

Note : *Question no. 1 is compulsory. Answer any four questions from question no. 2 to 8. Use of scientific calculator is allowed.*

1. Choose the best answer for the following questions : $7 \times 2 = 14$

(a) In a rectangular key with width w and the shaft diameter d , the usual proportion of width w is

(i) $d/10$

(ii) $d/4$

(iii) $d/6$

(iv) $d/8$

- (b) Oldham coupling is used to connect two shafts which are
- (i) perfectly aligned
 - (ii) not in exact alignment
 - (iii) having lateral misalignment
 - (iv) having axes which intersect at some angle

- (c) If T_1 and T_2 are tensions in tight and slack side of a belt drive, μ is the coefficient of friction and θ is the angle of lap, then

(i)
$$\frac{T_1}{T_2} = e^{\mu \theta}$$

(ii)
$$T_2 = T_1 \times e^{\mu \theta}$$

(iii)
$$\mu \theta = \frac{T_1}{T_2}$$

(iv)
$$T_1 - T_2 = e^{\mu \theta}$$

- (d) Maximum shear stress theory is used for the shafts made of

- (i) Hard material
- (ii) Soft material
- (iii) Brittle material
- (iv) Ductile material

(e) In order to have smooth operation, the minimum number of teeth on small sprocket, for moderate speeds, should be

(i) 15

(ii) 17

(iii) 21

(iv) 25

(f) The static tooth load should be _____ the dynamic tooth load.

(i) less than

(ii) greater than

(iii) equal to

(iv) None of the above

(g) The number of starts on the worm gear for a velocity ratio of 40 should be

(i) single

(ii) double

(iii) triple

(iv) quadruple

2. (a) Explain different types of Sunk keys with suitable diagrams. 7
- (b) Design a muff coupling used to connect two steel shafts. Shaft and key are made of steel which has allowable shear stress of 40 MPa and crushing strength of 80 MPa. Muff is made of cast-iron with permissible shear stress of 15 MPa. 7
3. (a) Derive the condition for maximum power transmitted in a belt drive. 7
- (b) Give the standard procedure of designating a V belt drive. 7
4. (a) Write the advantages and disadvantages of involute and cycloidal teeth. 7
- (b) A pair of straight teeth spur gears is to transmit 20 kW when the pinion rotates at 300 rpm. The velocity ratio is 1:3. Allowable static stress for the pinion and gear material is 120 MPa and 100 MPa respectively. Pinion has 15 teeth and face width 14 times the module. Determine (i) the Module and (ii) the Face width. Assume suitable tooth factory and velocity factor c . 7
5. (a) Explain the desired properties and selection of gear material. 7
- (b) Compare the belt drives, rope drives and gear drives. 7

6. (a) Explain the types of failures in a Bevel gear. 7
- (b) Explain the advantages of Helical gears over Spur gears. 7
7. (a) Enlist different gear manufacturing techniques. Explain any one of them. 7
- (b) Explain different terminologies associated with worm gears. 7
8. A worm drive transmits 15 kW at 2000 rpm and runs a gear which runs at 75 rpm. Worm is triple threaded and has 65 mm pitch diameter. The worm gear has 90 teeth of 6 mm module. The tooth form is 20° full depth involute. The coefficient of friction between the mating parts is 0.10. Calculate the (a) Tangential force acting on the arms, (b) Axial thrust and separating force on arms, and (c) Efficiency of the drive. 14
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