**BIME-022**

# DIPLOMA MECHANICAL ENGINEERING (DMEVI)

### Term-End Examination

### December, 2012

## BIME-022 : POWER TRANSMITTING ELEMENTS

*Time : 2 hours*                                     *Maximum Marks : 70*

*Note :*  (i)  Que-**1** is compulsory.

(ii)  Attempt **five** questions.

1.  (a)  If the diameter of a solid shaft is 'd' and allowable shear stress is 'τ' then the torsional strength is given by :                **2x7=14**

   (i)   $\dfrac{\pi}{32} d^4 \tau$    (ii)  $\dfrac{\pi}{64} d^3 \tau$

   (iii)  $\dfrac{\pi}{16} d^3 \tau$    (iv)  $\dfrac{\pi}{32} d^3 \tau$

   (b)  The taper on a rectangular sunk key is :
   (i)  1 : 100    (ii)  1 : 48
   (iii)  1 : 32    (iv)  1 : 16

   (c)  For a spur gear the product of circular pitch to diameter pitch is :-
   (i)  Unity    (ii)  π

   (iii)  $\dfrac{1}{\pi}$        (iv)  module.

(d) A solid shaft transmits a torque 'T' at allowable stress '$\tau_{all}$'. Its diameter is :

(i) $\sqrt[3]{\dfrac{16T}{\pi\tau_{all}}}$ (ii) $\sqrt[3]{\dfrac{32T}{\pi\tau_{all}}}$

(iii) $\sqrt[3]{\dfrac{16T}{\tau_{all}}}$ (iv) $\sqrt[3]{\dfrac{64T}{\pi\tau_{all}}}$

(e) The groove angle of the pulley for a V-belt drive is :

(i) $20° - 25°$ (ii) $25° - 32°$

(iii) $32° - 38°$ (iv) $38° - 45°$

(f) For smooth operation of a chain drive the min. number of teeth in the smaller sprocket is :

(i) 21 (ii) 14 (iii) 17 (iv) 25

(g) A key made of a cylindrical disc-segment cross-section is called.

(i) Tangent key

(ii) Flat-Sadde key

(iii) Gib-headed key

(iv) Woodruff key.

2. Design a pair of Kennedy key for transmitting **14** 30KW at 360 rpm. The shaft and key both are made of C50 steel ($\sigma_y = 390$ N/mm²). Take factor of safety = 3.0.

3. A pulley is keyed to a shaft between two bearings. **14** The shaft is made of steel with UTS = 600 N/mm² and the $\sigma_y$ = 450 N/mm². The bending moment at pulley varies from -200 N-m to 400 N-m and the torque in the shaft varies from -100 N-m to 250 N-m. Design a suitable shaft for infinite life. Additional data are given as
   (a) Factor of saftely = 1.5
   (b) Load correction factor in bending 1.0
   (c) Load correction factor in torsion = 0.6
   (d) Size factor = 0.85
   (e) Surface factor = 0.9
   (f) Stress correction factor in bending=1.6 and
   (g) Stress correction factor in torsion = 1.3

4. A leather belt 9 mm × 250 mm is used to drive a **14** cast Iron pulley 900 mm in diameter at 336 rpm. If the active arc on the smatter pulley is 120° & the stress in tight side is 2MPa, find the power capacity of the belt. The density of leather is 980 kg/m³ and the coefficient of friction of leather on cast Iron is 0.35.

5. (a) What are the advantages and disadvantages    9
       of using involute profile vis-a-vis cycloidal
       profile in gears ?

   (b) What is interference in involute profile ?    5


6. (a) What do you understand by simplex,    9
       duplex and triplex chains ? Explain in detail.

   (b) Describe salient chains briefly.    5


7. (a) Discuss the characteristics and advantages    8
       of helical gears.

   (b) Carryout a comparative discussion on single    6
       and multi start worm.


8. Write a short notes on (*any four*) :    4x3½=14

   (a) Materials of which belts are made.

   (b) Gear manufacture by hobbing.

   (c) Whirling of shaft.

   (d) Light and medium duty keys.

   (e) Coupling of shafts that have axial
       misalignment.

   (f) Splines.