

02095

DIPLOMA VIEP MECHANICAL ENGINEERING

Term-End Examination

December, 2012

BIME-025 : DESIGN OF MACHINE ELEMENTS

Time : 2 Hours

Maximum Marks : 70

*Note : Attempt **any four** questions between 2 to 8 and **first** question is compulsory. Design data book is allowed. All questions carry **equal** marks.*

1. (a) Heavy drive zone fit is : 7x2=14
- (i) Clearance fit.
 - (ii) Transition fit.
 - (iii) Interference fit.
 - (iv) Free fit.
- (b) Which of the following key is used when it is necessary to slide a pulley along the shaft ?
- (i) Tangent keys
 - (ii) Taper keys
 - (iii) Prismatic keys
 - (iv) Feather keys

- (c) Bolts used in shaft couplings are subjected to :
- (i) Tensile stress
 - (ii) Compression stress
 - (iii) Bending stress
 - (iv) Shear stress
- (d) The stress which varies from a minimum to a maximum value of the same nature (i.e tensile or compression) is called :
- (i) Repeated stress
 - (ii) Fluctuating stress
 - (iii) Yield stress
 - (iv) Alternating stress
- (e) Usual proportion of the width (w) of key in terms of shaft diameter (d) is :
- (i) $d/8$ (ii) $d/6$ (iii) $d/4$ (iv) $d/2$
- (f) Connecting rod is designed as a :
- (i) Long column
 - (ii) Short column
 - (iii) Strut
 - (iv) Axle
- (g) Spring is cut into two equal parts and parts are connected in parallel then the stiffness will :
- (i) Increase
 - (ii) Decrease
 - (iii) Remain same
 - (iv) Be one fourth of original

2. What are the general considerations in design 14
Discuss in brief.
3. The piston rod of a steam engine is 50mm in diameter and 600 mm long. The diameter of piston is 400 mm and the maximum steam pressure is 0.9 N/mm^2 . Find the compression of the piston rod if $E = 210 \text{ kN/m}^2$ of the piston rod material. 14
4. Derive torsion equation for shaft which is subjected to torque only ? 14
5. Write short notes with the help of a neat diagram. 2x7=14
(a) Flange coupling
(b) Flexible bushed pin coupling
6. Design a Knuckle joint to connect two steel bars under a tensile load of 25kN. Allowable stresses are 65MPa in tension, 50MPa in shear and 83MPa in crushing. 14
7. Find the Euler's crippling load for a hollow cylindrical steel column of 38 mm external diameter and 35 mm thick. The length of the column is 2.3 m and hinged at its both ends. Take $E = 200 \text{ GN/mm}^2$. Also determine the crippling load by Rankine's formula using $\sigma_c = 320 \text{ MPa}$ and $a = \frac{1}{7500}$. 14

8. Write short notes on *any four* of the following : 4x3½=14
- (a) Buckling in helical springs.
 - (b) Stress concentration.
 - (c) Variable stress in machine parts.
 - (d) Endurance limit.
 - (e) Keys and cotters.
 - (f) Rankine Gordan's Formula.
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