No. of Printed Pages : **4 + Drawing Sheet** **BIME-025**

DIPLOMA VIEP MECHANICAL ENGINEERING

02385

Term-End Examination

June, 2012

BIME-025 : DESIGN OF MACHINE ELEMENTS

Time : 2 Hours *Maximum Marks : 70*

Note : *Attempt **any four** questions between **02** to **08**. And **first** Question is **compulsory**. Design Data book is allowed.*

1. (a) The notch sensitivity q is expressed interms of fatigue stress concentration factor K_f and theoretical stress concentration factor K_t, as : **2x7=14**

(i) $\frac{K_f+1}{K_t+1}$ (ii) $\frac{K_f-1}{K_t-1}$

(iii) $\frac{K_t+1}{K_f+1}$ (iv) $\frac{K_t-1}{K_f-1}$

(b) A basic hole is one whose :

(i) Lower deviation is zero

(ii) Upper deviation is zero

(iii) Lower and upper deviation is zero

(iv) None of these

(c) Which of the loading is considered for the design of axles ?

(i) Bending moment only

(ii) Twisting moment only

(iii) Combined bending moment and torsion

(iv) Combined action of bending moment, Twisting moment and axial thrust

(d) The usual proportion for the width of key is :

(i) d/8 (ii) d/6

(iii) d/4 (iv) d/2

(e) Where d = diameter of shaft Oldham coupling is used to connect two shafts :

(i) Which is perfectly aligned

(ii) Which are not in exact alignment

(iii) Which have lateral misalignment

(iv) Whose axes intersect at a small angle

(f) The close coiled helical springs with stiffness K_1 and K_2 respectively are connected in series. The stiffness of an equivalent spring is given by :

(i) $\frac{K_1.K_2}{K_1+K_2}$ (ii) $\frac{K_1-K_2}{K_1+K_2}$

(iii) $\frac{K_1+K_2}{K_1.K_2}$ (iv) $\frac{K_1-K_2}{K_1.K_2}$

(g) The ratio of equivalent length of a column, having one end fixed and the other hinged, to its length is :

(i) 2 (ii) $\sqrt{2}$

(iii) 1/2 (iv) $1/\sqrt{2}$

2. Discuss the Design procédure with neat and clean diagram. **14**

3. A non-rotating shaft supporting a load of 2.5 kN is shown in fig.1. The material of the shaft is brittle, with an ultimate tensile strength of 300 N/mm^2 and a factor of safety is 3. Determine the dimensions of the shaft. **14**

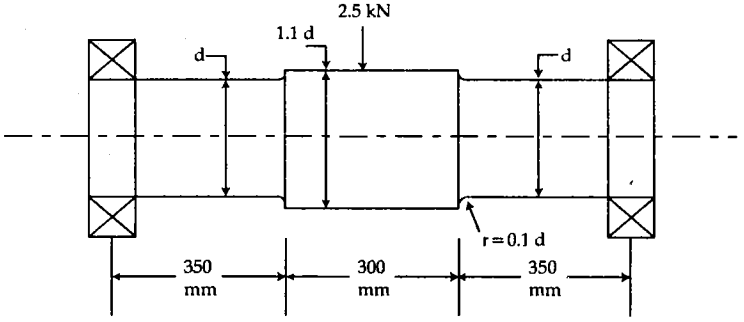

Fig. 1

4. Derive the expression when shaft subjected to bending moment only. **14**

5. What is key ? Explain different types of key. **14**

6. A closely coiled helical spring is made out of 10 mm diameter steel rod. The coil consists of 10 complete turn with a mean diameter of 120 mm. The spring carries an axial pull of 200N. Find the maximum shear stress induced in the section of the rod. If $C = 80GN/m^2$. Find the deflection in the spring, the stiffness and strain energy stored in the spring. **14**

7. Compare the crippling loads given by Rankine's and Euler's formulae for tubular strut 2.25 m long having outer and inner diameters of 37.5 mm and 32.5 mm loaded through pin joint at both ends. **14**

   Take : Yield stress as $315MN/m^2$; $a = \frac{1}{7500}$ and $E = 200GN/m^2$

   If elastic limit for the material is taken as $200\ MN/m^2$; then for what length of street does the Eular formula cease to apply ?

8. Write short note. Attempt ***any four*** of the following : **3.5x4=14**

   (a) S - N Curve
   (b) Endurance Limit
   (c) Notch sensitivity
   (d) Goodman diagram
   (e) Fatigue failure
   (f) Design for finite and Infinite life