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BIME-025

DIPLOMA – VIEP – MECHANICAL ENGINEERING (DMEVI)

Term-End Examination

00856

June, 2016

BIME-025 : DESIGN OF MACHINE ELEMENTS

Time : 2 hours *Maximum Marks : 70*

Note : *Question no. 1 is **compulsory**. Attempt any **four** questions from questions no. 2 to 8. Design data book is allowed. Scientific calculator is allowed.*

1. Choose the correct answer. *7×2=14*

(a) Following is ***not*** one of the failures :

(i) Fracture

(ii) Elastic deflection

(iii) Yielding

(iv) Fatigue

(b) As per Morgan, the meaning of 'orange' colour is

(i) Danger-hazard

(ii) Caution

(iii) Safety

(iv) Possible danger

(c) Following is ***not*** a mechanical property :

(i) Resilience

(ii) Plasticity

(iii) Hardening

(iv) Hardness

(d) The value of surface roughness for cylinder bores and pistons is

(i) 0·50 micron

(ii) 0·40 micron

(iii) 0·30 micron

(iv) 0·20 micron

(e) The thickness of cotter, when diameter of rod (d) is given, is

(i) $t = d$

(ii) $t = 0{\cdot}21\ d$

(iii) $t = 0{\cdot}31\ d$

(iv) $t = 0{\cdot}41\ d$

(f) Following is a sunk key in the form of semi-circular disk of uniform thickness :

(i) Saddle key

(ii) Woodruff key

(iii) Gib head taper key

(iv) Saddle key

(g) The S-N diagram is also called as

(i) Morgan's diagram

(ii) Wohler diagram

(iii) Euler's diagram

(iv) Goodman diagram

2. Explain the construction of clamp coupling (Split-Muff Coupling) with a neat diagram and brief the design procedure for the same. *14*

3. A rod of linkage mechanism, made of steel 40Cr1 (S_{ut} = 550 N/mm^2), is subjected to a completely reversed axial load of 100 kN. The rod is machined on the lathe and the expected reliability is 95%. There is no stress concentration. Determine the diameter of the rod using a factor of safety of 2 for an infinite life condition. *14*

4. The standard cross-section for a flat key, which is fitted on a 50 mm diameter shaft, is 16 × 10 mm. The key is transmitting 475 N-m torque from the shaft to the hub. The key is made of commercial steel (S_{yt} = S_{yc} = 230 N/mm^2). Determine the length of the key, if the factor of safety is 3. *14*

5. Write short notes with diagrams : *14*
   (a) Knuckle joint
   (b) Different types of keys

6. A helical compression spring of a cam mechanism is subjected to an initial preload of 50 N. The maximum operating force during the load cycle is 150 N. The wire diameter is 3 mm, while the mean coil diameter is 18 mm. The spring is made of oil-hardened and tempered valve spring wire of grade-VW (S_{ut} = 1430 N/mm^2). Determine the factor of safety used in the design on the basis of fluctuating stresses. *14*

7. Explain with diagram, the 'piston' of an IC engine and also mention the design requirements for the piston. *14*

8. Write short notes on any ***four*** of the following : $4 \times 3\frac{1}{2} = 14$

(a) Creativity in Design

(b) Aesthetic Design Principles

(c) S-N Curve

(d) Shafts and their types

(e) Compression and Torsion Springs

(f) Limits, Fits and Tolerances