(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 4015 Roll No. | | | | | | | | | | |

B.Tech.

FIFTH SEMESTER EXAMINATION, 2004-2005

MACHINE DESIGN - I

Time : 2 Hours *Total Marks : 50*

Note : *(i) Attempt **ALL** questions.*

(ii) Missing data, if any, may be suitably assumed.

(iii) Only databook related to design is allowed.

1. Answer *any two* of the following :– **(6x2=12)**

(a) (i) Define creep and fatigue.

(ii) What are the reasons for the use of alloy steels in machine parts ?

(iii) How do you classify materials for engineering use ?

(b) (i) Write short notes on high speed tool steel and spring steel.

(ii) Discuss the effect of Si, Mn, S and P on cast iron.

(iii) Explain the uses of wood and glass in place of steel in machine design.

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(c) (i) Give two typical applications of each of the following alloys. (a) monel metals (b) babbit metal.

(ii) Explain hardening and tempering.

(iii) Explain the importance of preferred size in design process.

2. Answer *any two* of the following : – **(6x2=12)**

(a) A line shaft rotating at 200 rpm. is to transmit 200 KW. The allowable shear stress for the material of the shaft is 42 MPa. If the shaft carries a central load of 900 N and is simply supported between bearings 3 m apart, determine the diameter of the shaft. The maximum tensile or compressive stress is not to exceed 56 MPa.

(b) Determine the size of the piston rod subjected to a total load of having cyclic fluctuation from 15 KN in compression to 25 KN in tension. The endurance limit is 360 MPa and yield strength is 400 MPa. Take impact factor 1.25, factor of safety = 1.5, surface finish factor = 0.88 and stress concentration factor = 2.25.

(c) (i) Write a note on the influence of various factors on the endurance limit of a ductile material.

(ii) What is the criterion of failure for ductile material subjected to static load.

(iii) Write about the various theories of failure.

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3. Answer *any two* of the following : – **(6½x2=13)**

(a) A double rivetted lap joint with chain rivetting is to be made for joining two plates of 6 mm thickness. Determine diameter of the rivets, distance between rows of rivets and pitch of rivets. Indicate how the joint will fail ? Assume $\sigma_t = 220$ MPa, $\tau = 100$ MPa, $\sigma_c = 150$ MPa.

(b) Design a rectangular key for a shaft of 50 mm diameter. The shearing and crushing stresses for the key and shaft materials are 42 MPa and 72 MPa.

(c) What are the assumptions made in the design of welded joints ?

4. Answer *any two* of the following : – **(6½x2=13)**

(a) Design a spring for a balance to measure 0 to 1000 N over a scale of length 80 mm. The spring is to be enclosed in a casing of 25 mm diameter. The approximate number of turns is 30. The modulus of rigidity is 85 KN/mm^2, calculate the max. shear stress induced.

(b) In a hand vice the screw has a double start square threads of 26 mm diameter. If the lever is 0.25 m and the max. force that can be applied at the end of the lever is 300 N, determine the force with which the job is held in the jaws of the vice. Take the coefficient of friction as 0.14.

(c) (i) Give the design procedure for the design of screw jack.

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(ii) What do you understand by A.M. Wahl's factor and state its importance in design of springs.

(iii) What is nipping in leaf springs. Discuss its role.

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