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Printed Pages : 3 **ME-502**

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

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

B. Tech.

(SEM. V) EXAMINATION, 2007-08

MACHINE DESIGN - I

Time : 2 Hours] *[Total Marks : 50*

Note : *(1) Answer the following questions.*
(2) Use of Design Data Book is permitted.
(3) Assume missing data suitably, if any.

1. Answer any **two** of the following : **5×2**

(a) Discuss the machine design cycle in brief. Compare design Synthesis with design analysis.

(b) What are preferred number ? How will you find the number belonging to R_s series ?

(c) How will you designate the following materials ?

(i) Plain carbon steel with a minimum yield strength of 200 N/mm^2.

(ii) Alloy steel with the following composition; carbon=0.35% to 0.45%,
chromium = 0.9% to 1.20%.

(iii) Cast steel with a minimum tensile strength of 450 N/mm^2 and a yield strength of 230 N/mm^2.

(iv) Grey cast iron with an ultimate tensile strength of 300 N/mm^2 .

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2. Answer any **two** of the following : 5×2

(a) Two rods are connected by means of knuckle joint. The axial force acting on the rod is 30 kN. The rod and the pin are made of plain carbon steel 45C8 and the factor of safety is 2.5. Calculate the diameter of the rods and diameter of the pin.

(b) A cantilever beam, made of cold drawn C40 steel of circular cross section as shown in fig (1) is subjected to a load which varies –F to 3F. Determine the maximum load that this member can withstand for an indefinite life using a factor of safety 1.5. Assume a theoretical stress concentration factor of 1.5 and notch sensitivity for a fillet radius of 3 mm to be 0.9.

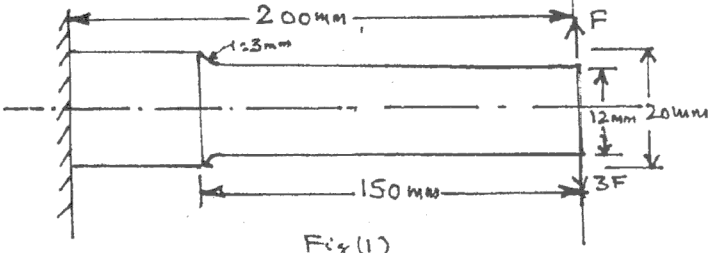

Fig (1)

(c) Write brief notes on any **two** of the following :

(i) Stress concentration

(ii) Soderberg diagram

(iii) Graphical representation of maximum strain energy theory.

3. Two length of a mild steel tie rod (flate plate) 190 mm × 12 mm are to be connected together by means of lap joint, using only four rivets. Design the rivet joint, when the rods are subjected to tensile load 300 kN. 15

OR

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3 A shaft is supported by two bearings 400 mm apart and carries a bevel gear of 200 mm pitch diameter at one end overhanging beyond the nearer bearing by 150 mm. The gear produced a raidial load of 9.8 kN and a thrust load of 2.94 kN when the speed is 500 r.p.m. Design the shaft. **15**

4 A screw press is to exert a force of 50 kN. The unsupported length of screw is 400 mm nominal diameter of screw is 50 mm. The material of screw and nut are medium carbon steel and cast iron respectively. Design the screw press. **15**

OR

4 Design a spring for a boiler safety valve of 65 mm diameter required to blow off at a steam pressure of 1.05 N/mm^2. The initial compression of a spring is 35 mm and lift is limited to 25 mm. Take spring index = 6. **15**

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