R09

Code No: C1501

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Tech I - Semester Examinations, March/April 2011
ADVANCED MECHANICAL ENGINEERING DESIGN
(MACHINE DESIGN)

Time: 3hours **Max. Marks: 60**

Answer any five questions
All questions carry equal marks

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1.(a) Sketch the heart of a design process, and explain its components.
(b) Distinguish between the Asirnov model and Norton model. [12]

2.(a) Explain the mathematical modeling similitude relations in product design.
(b) Bring out the differences between design for safety and design for reliability. [12]

3.(a) Write a note on the aesthetic and ergonomic considerations in product design.
(b) Discuss the product design for sand castings from the point of view of designing for minimizing the shrinkage defects. [12]

4.(a) Explain the following terms:
Product specification; Product planning; Product strategies
(b) Differentiate between the harmful and beneficial residual stresses. [12]

5. A solid circular shaft made of steel Fe 620 (S_{ut} = 620 N/mm^2 and S_{yt} = 380 N/mm^2) is subjected to an alternating torsional moment which varies from -200 N-m to +400 N-m. The shaft is ground, and the expected reliability is 90%. Neglecting stress concentration, calculate the shaft diameter for infinite life, using the distortion energy theory of failure. The factor of safety may be taken as 2.0 [12]

6. (a) The work cycle of a mechanical component subjected to completely reversed bending stresses consists of the following elements:
i) ± 350 N/mm^2 for 85% of time,
ii) ± 400 N/mm^2 for 12% of time, and
iii) ± 500 N/mm^2 for 3% of time.
The material of the component is 50C4 (S_{ut} = 660 N/mm^2), and the corrected endurance strength of the component is *28*0 N/mm^2. Determine the life of the component.
(b) Distinguish between the design procedures for surface failure due to adhesive wear and abrasive wear. [12]

7.(a) Discuss the effect of dynamic contact stresses in surface failures.
(b) Write a note on the material and process selection in value engineering. [12]

8. Write short notes on:
(a) Breakeven analysis
(b) Ergonomics in engineering design [12]

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