Date. 26/12/2016.

Exam No: _____

GANPAT UNIVERSITY

M. TECH SEM- I [ME-(CAD/CAM)] REGULAR EXAMINATION NOV-DEC 2016

3ME112 Advanced Machine Design-I

MAX. TIME: 3 HRS **MAX. MARKS: 60**

Instructions: (1) This question paper has two sections. Attempt each section in separate answer book.
(2) Figures on right indicate marks.
(3) Be precise and to the point in answering the descriptive questions.

SECTION: I

Q.1

(a) Enumerate different basic principles of design. **[05]**

(b) What is Design for Assembly? Explain the general principles to be followed while designing the parts for assembly? **[05]**

OR

Q.1

(a) Define interchangeability and discuss its importance in design. **[05]**

(b) Enlist and explain different types of design. **[05]**

Q.2

(a) Sketch and explain S-N diagram for ferrous and Non-ferrous material. **[03]**

(b) A cantilever beam of circular cross section is fixed at one end and is subjected to completely reversed force of 100 kN at the free end. The force is perpendicular to the axis of the beam. The distance between the fixed and free end of the cantilever beam is 400 mm. There is no stress concentration. The beam is made of steel with an ultimate tensile strength of 1300 MPa. The surface finish factor for the beam is 0.87 and the size factor is 0.85. The reliability factor is 0.868. Determine the diameter of the beam for a life of 47500 cycles. **[07]**

OR

Q.2

(a) How will you distinguish between static and fatigue failures? **[03]**

(b) A cantilever beam of circular cross section, made of cold drawn steel having ultimate tensile strength of 550 N/mm², is fixed at one end and is subjected to completely reversed force of 15 kN at the free end. The force is perpendicular to the axis of the beam. The distance between the fixed and free end of the cantilever beam is 200 mm. The theoretical stress concentration factor and the notch sensitivity at the fixed end are 1.35 and 0.85 respectively. The surface finish factor for the beam is 0.80. The expected reliability is 90% and the reliability factor is 0.897. Find diameter of the beam. The values of size factor are as follows. **[07]**

Diameter, d in mm	Size factor
$d \leq 7.5$	1.00
$7.5 < d \leq 50$	0.85
$d > 50$	0.75

Q.3 Attempt following. (Any Two) **(10)**

(a) What is stress concentration? Explain its effect in fatigue loading. Also explain method of reducing the effects of stress concentration.

(b) List out the material selection methods and explain any two each methods in brief.

(c) Explain the materials selection process for a new product (new design) and an existing design.

SECTION: II

Q.4

(a) Explain distortion-energy theory for ductile materials. **(05)**

(b) Describe modifications of the Mohr hypothesis for brittle materials. **(05)**

OR

Q.4

(a) Write a short note on Coulomb-Mohr theory for ductile materials. **(05)**

(b) Explain maximum normal stress theory for brittle materials. **(05)**

Q.5

(a) Define creep. Enlist the effect of high temperature on metals. Distinguish clearly between creep test and stress rupture test using neat sketches. **(05)**

(b) Describe Probabilistic approach to design. **(05)**

OR

Q.5

(a) Explain Mechanism of creep in metal in brief. **(05)**

(b) Describe FMEA in details. **(05)**

Q.6 **Attempt Any TWO.** **(10)**

(a) Enlist the reasons for failures occur in system & objective of reliability. Also explain reliability theory.

(b) Draw creep curve and explain three stages of creep curve.

(c) A ductile hot-rolled steel bar has minimum yield strength in tension and compression of 50 kpsi. Using the distortion-energy and maximum-shear-stress theories determine the factors of safety for the following plane stress states:

(a) $\sigma_x = 12$ kpsi, $\sigma_y = 6$ kpsi

(b) $\sigma_x = 12$ kpsi, $\tau_{xy} = -8$ kpsi

(c) $\sigma_x = -6$ kpsi, $\sigma_y = -10$ kpsi, $\tau_{xy} = -5$ kpsi

(d) $\sigma_x = 12$ kpsi, $\sigma_y = 4$ kpsi, $\tau_{xy} = 1$ kpsi

----------**END OF PAPER**----------