M. Tech New Date: 28/12/2017.

Exam No: _____

GANPAT UNIVERSITY

M. TECH SEM- 1st (CAD-CAM) REGULAR EXAMINATION NOV-DEC 2017

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 Attempt Following.

(A) Explain different types of design. (05)

(B) Explain material selection process with suitable design example. (05)

OR

Q. 1 Attempt Following.

(A) What is the effect of tolerances on productivity? Why should close tolerances be avoided, if possible? (05)

(B) List out the material performance characteristics and explain its in details. (05)

Q.2 Attempt Following.

(A) Explain fatigue stress concentration factor and notch sensitivity. (04)

(B) A cantilever beam of circular cross section having ultimate tensile strength of 500 N/mm^2, is subjected to a completely reversed force of 1.2 kN as shown in **Fig. 1**. The notch sensitivity at the fillet is 0.6. Determine the diameter 'd' for a life of 8000 cycles. Assume surface factor as 0.8, size factor as 0.9 and the calculations are expected at 90 % reliability, for which the reliability factor is 0.897. Theoretical stress concentration factor may be taken as 1.5. (06)

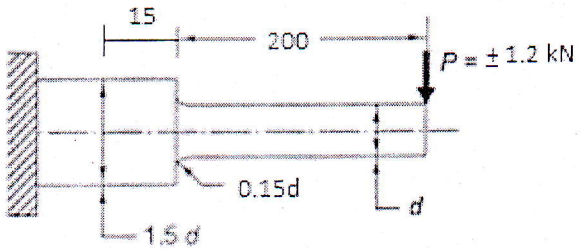

Fig. 1

OR

Q.2 Attempt Following.

(A) Explain Soderberg's criteria with neat sketch. (04)

(B) A cantilever beam of circular cross section, made of cold drawn steel having ultimate tensile strength of 550 N/mm^2, 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. The values of size factor are as follows. (06)

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 Any TWO.** (10)

(A) Explain the various phases in design.

(B) Write short-note on economics of materials.

(C) Sketch and explain S-N diagram for ferrous and non-ferrous material.

SECTION: II

Q.4 **Attempt Following.**

(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) Explain fault tree analysis in details. (05)

OR

Q.4 **Attempt Following.**

(A) Draw creep curve and explain three stages of creep curve. (05)

(B) Enlist the reasons for failures occur in system and objective of reliability. Also explain reliability theory. (05)

Q.5 **Attempt Following.**

(A) Explain modified Mohr theory for brittle materials. (05)

(B) A hot-rolled steel has a yield strength of $S_{yt} = S_{yc} = 100$ kpsi and a true strain at fracture of $\varepsilon_f = 0.55$. Estimate the factor of safety for the following principal stress states: (05)

(a) 70, 70, 0 kpsi.

(b) 30, 70, 0 kpsi.

(c) 0, 70, −30 kpsi.

(d) 0, −30, −70 kpsi.

(e) 30, 30, 30 kpsi.

OR

Q.5 **Attempt Following.**

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

(B) A ductile hot-rolled steel bar has a 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: (05)

(a) $\sigma_A = 12$ kpsi, $\sigma_B = 12$ kpsi

(b) $\sigma_A = 12$ kpsi, $\sigma_B = 6$ kpsi

(c) $\sigma_A = 12$ kpsi, $\sigma_B = -12$ kpsi

(d) $\sigma_A = -6$ kpsi, $\sigma_B = -12$ kpsi

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

(A) Define following terms:

(a) Hazard rate, (b) Risk (c) Mean Life, (d) Mean Time to Failures,

(e) Mean Time between Failures.

(B) Explain shear stress theory for ductile materials.

(C) Explain the mechanism of creep in metals.

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