KATHMANDU UNIVERSITY
End Semester Examination [C]
July, 2017

Marks scored:

Level : BE
Year : III

Course : MEEG 315
Semester : I

Exam. Roll No. :

Time: 30 mins.

F.M. : 20

Registration No.:

Date JUL 13 2017

SECTION "A"

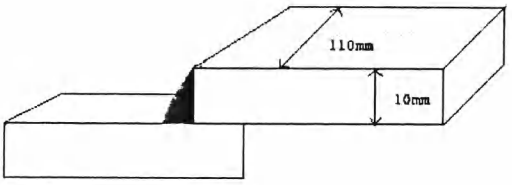
[20Q × 1=20 marks]

*Use of Data Book is **NOT** allowed for objective. Choose the most appropriate answer and **mark [X]**.*

1. A riveted lap joint has two rivets installed. Find the diameter of the rivet for the riveted joint, if the joint fail due to shearing of rivet. Provided P = 250 kN, τ = 60 N/mm^2.
[ ] 2.65 mm [ ] 1.62 mm [ ] 0.05 mm [ ] 51.50 mm

2. A close-coiled helical spring of stiffness 30N/mm is arranged in series with another such spring of stiffness 60 N/mm. The stiffness of composite unit is
[ ] 20 N/mm [ ] 30 N/mm [ ] 45 N/mm [ ] 90 N/mm

3. Calculate strength of the welded joint shown below, when 70 MPa is the allowable shear stress for the weld material.
[ ] 54.44 ×103 N [ ] 77 × 103 N [ ] 50 × 103 N [ ] None of the above



4. If welds are designed with in-plane eccentric load, then eccentric load can be replaced by
[ ] parallel force [ ] twisting moment [ ] both [ ] none

5. Leaf springs absorb shocks by
[ ] bending [ ] twisting [ ] compression [ ] tension

6. Angle of helix in a close coiled spring is
[ ]< 100 [ ] >100 [ ] =100 [ ] None

7. Strain energy in a spring should be
[ ] Large [ ] Small [ ] Zero [ ] None

8. Which type of nut was not designed to prevent slippage?
[ ] hexagon [ ] jam [ ] castle [ ] slotted

9. Which of the following is not a property of lubricants?
[ ] High specific heat [ ] High flash point
[ ] Low pour point [ ] Low oxidation stability

10. Which of the following bearings carry thrust load in one direction?
[ ] Deep groove ball bearings [ ] Taper roller bearings
[ ] Cylindrical roller bearings [ ] None of the above

11. Which strength will be least for a rivet in a riveted joint?
[ ] Tearing strength
[ ] Shearing strength
[ ] Crushing strength
[ ] None

12. A stud has threads on its shank from
[ ] One side
[ ] Both side
[ ] Using a nut for tightening
[ ] None

13. Starting friction is low in
[ ] Hydro-static lubrication
[ ] Hydro-dynamic lubrication
[ ] Mixed (or Semi-fluid) lubrication
[ ] Boundary lubrication

14. Concentric helical springs should be wound
[ ] in the same helix hand
[ ] in opposite helix hands
[ ] in any direction
[ ] depending on the load

15. Which of the following bearings can take up large thrust loads?
[ ] Deep-groove ball bearings
[ ] Filing-notch ball bearing
[ ] Self-aligning bearing
[ ] Angular-contact bearing

16. Identify the correct statement
[ ] Under fatigue load, casted structures are stronger than welded structures
[ ] Welding cannot produce complicated structures
[ ] Welding can join dissimilar materials
[ ] Rivetted joints produce light weight constructions as compared to welded joints

17. Identify the incorrect statement
[ ] In volute springs, number of active coils gradually decreases as load increases
[ ] Stiffness of spring decreases as number of coils decreases in conical springs
[ ] Torsion springs are generally spiral
[ ] Helical torsion springs are used in automobile starters

18. Tearing efficiency of a riveted joint is the ratio of
[ ] Tearing strength of solid plate/tearing strength of punched plate
[ ]Tearing strength of punched plate/tearing strength of the solid plate
[ ] Tearing strength of a rivet/tearing strength of sold plate
[ ] None

19. Stress concentration factor is defined as
[ ] ratio of highest stress near the discontinuity to yield strength
[ ] ratio of endurance limit to highest stress near the discontinuity
[ ] ratio of highest stress near the discontinuity to endurance limit
[ ] ratio of highest stress near discontinuity to nominal stress from elementary equation

20. Identify the incorrect statement.
[ ] V thread is not used in power screws
[ ] Wear is serious problem in power screws
[ ] Power screw can be designated with self-locking characteristics
[ ] The efficiency of trapezoidal threads is more than that of square threads

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Level : BE
Year : III
Time : 2 hrs. 30 min.

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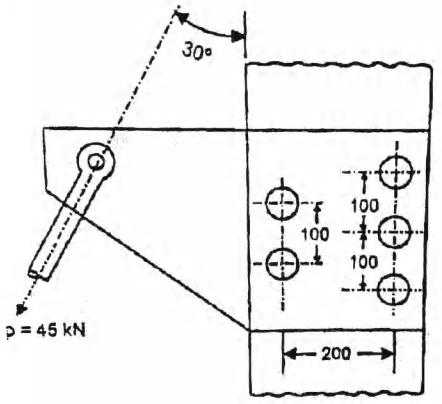
Semester :I
F.M. : 55

SECTION "B"
[5Q × 11 = 55 marks]

Use of Data Book is **ALLOWED** for this examination. Assume and/ or select suitable data if not specified. Answer *ALL* questions.

1. (a) A bracket is attached to a column by means of five rivets as shown in figure. Find the diameter of the rivet for the riveted connection, if the maximum shear stress is not to exceed 90 N/mm^2 in the most heavily loaded rivet. [5]

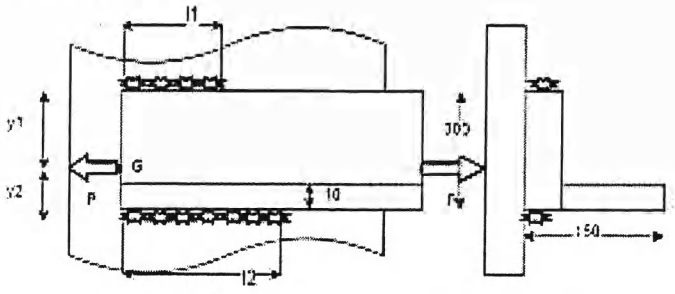


(b) A pressure vessel has an internal diameter of 1 m and is to be subjected to an internal pressure of 2.75 N/mm^2 above the atmospheric pressure. Considering it as a thin cylinder and assuming efficiency of its riveted joint to be 79%, calculate the plate thickness if the tensile stress in the material is not to exceed 88 MPa.

Design a longitudinal double riveted double strap butt joint with equal straps for this vessel. The pitch of the rivets in the outer row is to be double the pitch in the inner row and zig-zag riveting is proposed. The maximum allowable shear stress in the rivets is 64 MPa. You may assume that the rivets in double shear are 1.8 times stronger than in single shear and the joint does not fail by crushing.Make a sketch of the joint showing all calculated values. Calculate efficiency of the joint. [6]

2. (a) What is difference between new design and re design? Explain with examples. [3]

(b) Find the total length and size of weld required to with stand the load of 100kN. Permissible shear stress in weld is 70kN/mm². [5]



(c) "Design is an iterative process." Explain. [3]

3. (a) Explain any three types of positive locking devices along with a neat sketch? [3]

(b) Find the torque required to raise the load of 15kN and mean diameter of triple threaded screw being 46mm. Also given pitch=8mm and coefficient of friction is 0.15. [3]

(c) A square-threaded, single thread power screw is used to raise a known load.The screw has a mean diameter of 25 mm and two threads per cm. The collar meandiameter is 35mm. The coefficient of friction is estimated as 0.1 for both the thread andthe collar. Load to lift is 1000 N. [5]

(i) Determine the major diameter of the screw.

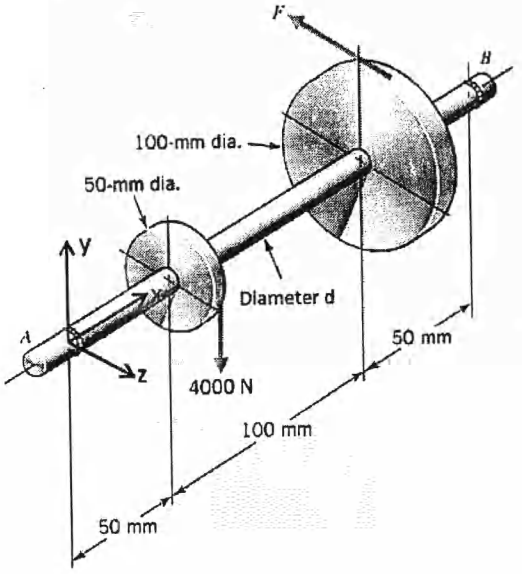
(ii) Estimate the screw torque required to raise the load.

(iii) If collar friction is eliminated, determine the minimum value of thread coefficient of friction needed to prevent the screw from overhauling.

4. (a) Self aligning bearing are being used in a head drum of conveyor. Explain why this selection of self aligning bearing is important? [3]

(b) The figure below shows a solid round shaft supported by deep groove ball bearings at A and B. Attached to the shaft are spurgear that are loaded as shown. The 40mm shaft rotates at 1000 rpm for 10×10^3 hours. Select suitable bearing for this condition.

Also select a suitable bearing if the orientation of the shaft is now changed to vertical. [8]



Take following material property:

	Ultimate Tensile Stress (MPa)	Density (kg/m^3)
Shaft	500	7850
Gear	200	7800

5. (a) What are the applications of Mono leaf spring and Multi leaf spring? [4]

(b) A helical compression spring must give a minimum force of 500 N and a maximum force of 750 N over an adjustment range of 2 cm static deflection. The spring material is A227 cold drawn wire; the loading is static. Design thespring. (G=79.6 GPa) [4]

(c) Explain why and what type of spring would you select if the space available is extremely limited and the load is high. [3]