KERALA AGRICULTURAL UNIVERSITY
B.Tech.(Agrl. Engg.) 2022 & Previous Admissions
III Semester Final Examination - February 2024

Fpme.2104   Machine Design (2+0)   Marks: 50
                                                                      Time: 2 hours

I   **Fill in the blanks**   (10x1=10)
   1.   Steel containing upto 0.15% carbon is known as ....
   2.   .... is defined as the ratio of maximum stress to the nominal stress.
   3.   Factor of safety for fatigue loading is the ratio of .... to the working stress.
   4.   The transverse fillet welded joints are designed for........................ strength.
   5.   The maximum shear stress theory is used for .... materials.
         State True or False
   6.   Failure of the material is called fatigue when it fails after the yield point.
   7.   Two shafts will have equal strength, if twisting moment of both shafts is same.
   8.   A screw is said to be self locking screw, if its efficiency is less than 50%.
   9.   The V-belts are particularly suitable for long drives.
   10.   When helical compression spring is cut into halves, the stiffness of the resulting spring will be double.

II   **Write short notes on ANY FIVE of the following**   (5x2=10)
   1.   What are the different types of loads that can act on machine components?
   2.   What are the factors affecting endurance strength?
   3.   What are the ways to reduce stress concentration?
   4.   What is an S-N Curve? Explain with the help of neat diagram.
   5.   What are the purposes in machinery for which couplings are used?
   6.   What is nipping of laminated leaf spring?
   7.   What do you understand by torsional rigidity?

III   **Answer ANY FIVE of the following**   (5x4=20)
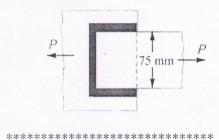   1.   Distinguish between cotter joint and knuckle joint.
   2.   Write Soderberg, Goodman and Gerber equations and represent then graphically. Also explain the importance of these criteria.
   3.   Design a leaf spring for the following specifications; total load=140 kN; number of springs supporting the load=4; maximum number of leaves=10; span of spring=1000 mm; permissible deflection=80 mm.
         Take Young's modulus as 200 kN/mm^2 and allowable stress in Spring material as 600 MPa.
   4.   Explain maximum shear stress theory of failure.
   5.   Determine the thickness of a 120 mm wide uniform plate for safe continuous operation if the plate is to be subjected to a tensile load that has a maximum value of 250 kN and minimum value of 100 kN. The properties of the plate material are as follows; endurance limit=225 MPa; yield point stress=300 MPa; factor of safety=1.5
   6.   Design a Flat belt drive to transmit 25 kW at 720 rpm to an aluminium rolling machine the speed reduction being 3.0. The distance between the shaft is 3m. Diameter of rolling machine pulley is 1.2 m.
   7.   What are the functions of Coupling? Also state the requirement of good Coupling.

IV   **Write an essay on ANY ONE of the following**   **(1x10=10)**

1. How the shaft is designed when it is subjected to twisting moment only?
2. A plate 75 mm wide and 12.5 mm thick is joined with another plate by a single transverse weld and a double parallel fillet weld as shown in figure below. The maximum tensile and shear stresses are 70 MPa and 56 MPa respectively. Find the length of each parallel fillet weld, if the joint is subjected to both static and fatigue loading.

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