

END TERM EXAMINATION

FOURTH SEMESTER [B.TECH] JUNE 2025

Paper Code: MEC-212

Subject: Machine Design-I

Time: 3 Hours

Maximum Marks:60

Note: Attempt five questions in all including Q.No.1 which is compulsory. Select one question from each unit. Assume missing data, if any.

- Q1 Short Answer Type: (4x5=20)
- a) State and illustrate two principal design rules for casting design.
 - b) What do you mean by factor of safety?
 - c) What are flexible couplings and what are their applications? Illustrate your answer with suitable examples and sketches
 - d) What do you understand by the term 'efficiency of a riveted joint'?
 - e) What do you understand by overhauling of screw?

UNIT-I

- Q2 Explain: (Any two):- (5x2=10)
- a) Fatigue and Endurance limit of a material with S-N curve.
 - b) How the stress concentration in a component can be reduced
 - c) How the pipes are designed. Explain with suitable equations involved in pipe design.

- Q3 Design a knuckle joint to transmit 150 kN. The design stresses may be taken as 75 MPa in tension, 60 MPa in shear and 150 MPa in compression. (10)

UNIT-II

- Q4 Explain: (5x2=10)
- a) Classify keys with their neat sketches.
 - b) Flexible couplings with their design steps and what are their applications.

- Q5 A 45 mm diameter shaft is made of steel with a yield strength of 400 MPa. A parallel key of size 14 mm wide and 9 mm thick made of steel with yield strength of 340 MPa is to be used. Find the required length of key, if the shaft is loaded to transmit the maximum permissible torque. Use maximum shear stress theory and assume a factor of safety of 2. (10)

UNIT-III

- Q6 A double riveted lap joint is made between 15 mm thick plates. The rivet diameter and pitch are 25 mm and 75 mm respectively. If the ultimate stresses are 400 MPa in tension, 320 MPa in shear and 640 MPa in crushing, find the minimum force per pitch which will rupture the joint. If the above joint is subjected to a load such that the factor of safety is 4, find out the actual stresses developed in the plates and the rivets. (10)

- Q7 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 Fig. 1. 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. (10)

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P-1/2

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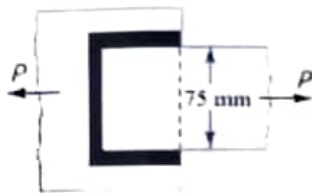


Fig. 1

UNIT-IV

08 Explain: (**Any two**)

(5x2=10)

- a) How does the helix angle influence on the efficiency of square threaded screw?
- b) What is self-locking property of threads and where it is necessary?
- c) The efficiency of self-locking screws is less than 50 percent.

09 Explain:

(5x2=10)

- a) How the gears classified and what are the various terms used in spur gear terminology?
- b) The design procedure of spur gears.
