

COCHIN UNIVERSITY OF SCIENCE AND TECHNOLOGY

B.TECH. DEGREE VI SEMESTER EXAMINATION IN MARINE ENGINEERING JUNE 2020

MRE 1606 MACHINE DESIGN AND DRAWING (2013 Scheme)

Time: 2hrs 30 Minutes [for Answering and Scanning/Uploading the page of the Answer Sheet per module]

Max. Marks: 70 (14 per module)

INSTRUCTIONS

1. You have to be available in Google Meet on demand by the faculty.
2. You have to share your 'live location' to the faculty before uploading the answer sheet.
3. You have to answer only one question per module.
4. Answer may not exceed one page of an A4 size paper in a standard handwriting, as far as possible.
5. If at all an answer goes beyond one page, (due to your handwriting) another page can also be used. In such a situation, the page number should be given as 1/2, 2/2.
6. You have to put dated signature along with Register Number, Subject Code, Module/Group Number (as given in the Question Paper) in each page.
7. You have to put the Question Number correctly.
8. After answering the question, you have to scan and upload the answer page.

MODULE - I

(Answer *ANY ONE* question)

- I(1). Briefly explain the process and also mention the situation where it is recommended. (14)
- (i) Flame hardening
 - (ii) Induction hardening
 - (iii) Case carburising
 - (iv) Carbo- nitriding
 - (v) Nitriding

OR

- I(2). Briefly explain the effect of addition of following elements to alloy steels (14)
- (i) Silicon
 - (ii) Manganese
 - (iii) Nickel
 - (iv) Chromium
 - (v) Tungsten

MODULE - II

(Answer *ANY ONE* question)

- II(1). As engineering point of view, how can we reduce the stress concentration in following cases? (14)
- (i) Due to V notch
 - (ii) Due to abrupt change in cross section
 - (iii) Due to keyways in shafts
 - (iv) Due to threaded components

OR

- II(2). As engineering point of view, what are the relevance of following factors in machine design calculations? (14)
- (i) Surface finish factor
 - (ii) Size factor
 - (iii) Reliability factor
 - (iv) Notch sensitivity factor

MODULE - III

(Answer *ANY ONE* question)

- III(1). A 75 mm diameter and 250 mm solid shaft is welded perpendicularly to a steel plate to form a cantilever to be loaded with P kN force at the free end. The maximum shear stress for the weld is 60 N/mm^2 and size of weld is 20 mm. (14)
- (i) Draw the figure with suitable markings
 - (ii) Calculate the value of P acting at the free end
 - (iii) Calculate the maximum normal stress

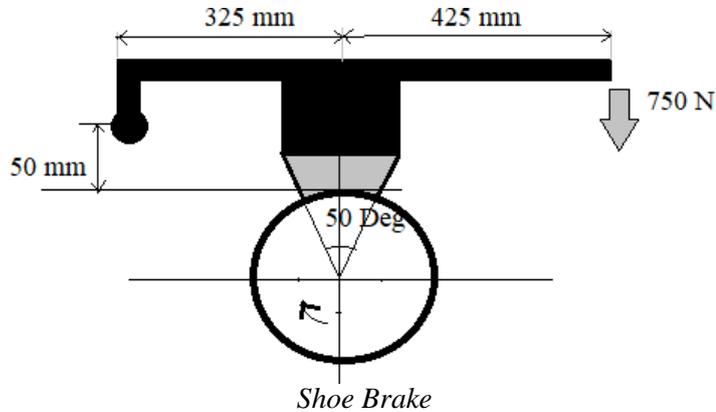
OR

- III(2). A double riveted lap joint is used to joint 16 mm thick two plates. The pitch of each row of rivets is 90 mm and the rivet diameter is 25 mm. the permissible stresses in tension, shear and crushing are 140 MPa, 110 MPa and 240 MPa respectively. (14)
- (i) Sketch the figure with suitable markings.
 - (ii) Find the efficiency of the joint.

MODULE - IV

(Answer *ANY ONE* question)

- IV(1). The diameter of the brake drum shown in Figure is 250 mm and the Coefficient of friction is 0.35. The width of the shoe is 130mm. Calculate



(14)

- (i) The value of braking torque
- (ii) Bearing pressure acting on shoe

OR

- IV(2). A single plate clutch with both sides effective is required to transmit 25 kW at 1600 RPM. The outer diameter of the plate is limited to 300 mm and the intensity of pressure between the plates not to exceed 0.07 N/mm². Assuming uniform wear and coefficient of friction 0.3, find

- (i) the inner diameter of the plates
- (ii) the axial force necessary to engage the clutch

(14)

MODULE - V

(Answer *ANY ONE* question)

- V(1). A / full depth spur gear made of bronze drives a mild steel pinion with angular velocity ratio of $\omega_g / \omega_p = 1$. It transmits 5 kW at 1800 RPM of pinion. The number of teeth should not be less than 15 teeth on either gear. The allowable static strength of bronze and mild steel are 84 MPa and 105 MPa respectively.

The Lewis factor for / pressure angle is

Considering strength alone, Find

- (i) Module
- (ii) Face width
- (iii) Diameter of gears

(14)

OR

- V(2). A pair of 20° stub helical gears with 30° helix angle is used to transmit 15 kW at 10000 RPM of the pinion. The velocity ratio is 4: 1. Both the gears are to be made of hardened steel of static strength 100 N/mm^2 and the number teeth on pinion is 24. The face width may be taken as 14 times the module. The tooth form factor for 20° pressure angle is (14)

From the standpoint of strength, Calculate

- (i) Module
- (ii) Face width
- (iii) Pitch diameter of gears
