

FINAL ALTERNATIVE ASSESSMENT

(COVER PAGE)

Session : April 2021

Programme : Diploma In Mechanical Engineering (DMEN)

Course : **EGM2169: Machine Components Design**

Date of Examination : 29th July 2021 (Thursday)

Time : 12.00pm – 2.30pm Reading Time : Nil

Duration : 2 hours 30 mins

Special Instructions :

This paper consists of **FOUR (4)** questions. Answer **ALL** the questions. **Write ALL your answer** in the foolscap papers (you need to prepare your own papers)

Material permitted : Non-Programmable Calculator

Materials provided : Nil

Examiner(s) : **Mr Soo Swee Yoong** and Mohammad Faiz Osrin

Chief Moderator : Teow Hsien Loong

This paper consists of 4 printed pages, including the cover page

DIPLOMA IN MECHANICAL ENGINEERING PROGRAMME (DMEN)
EGM2169: MACHINE COMPONENTS DESIGN
FINAL ALTERNATIVE ASSESSMENT: APRIL 2021 SESSION

Instruction: This paper consists of **FOUR (4)** questions. Answer all **FOUR (4)** questions. All questions carry equal marks.

Question 1

- (a) 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 Q1a. The maximum tensile and shear stresses are 70 MPa and 56 MPa respectively. Determine the length of each parallel fillet weld, if the joint is subjected to both static and fatigue loading.

(12 marks)

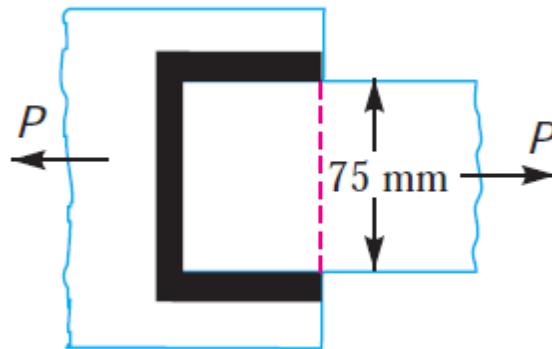
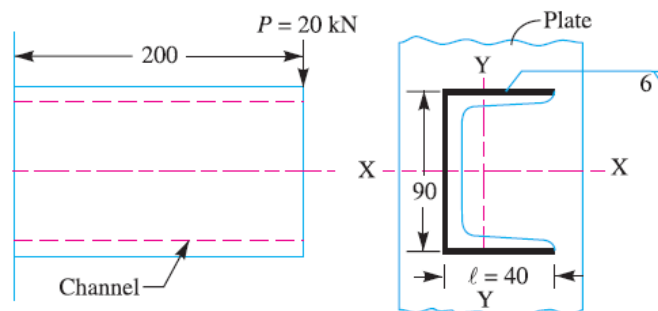


Figure Q1a

- (b) Figure Q1b shows a channel is welded to a plate and loaded with 20 kN force at a distance of 200 mm. Determine the maximum shear stress induced in the weld of 6 mm size.

(13 marks)

(Total: 25 marks)



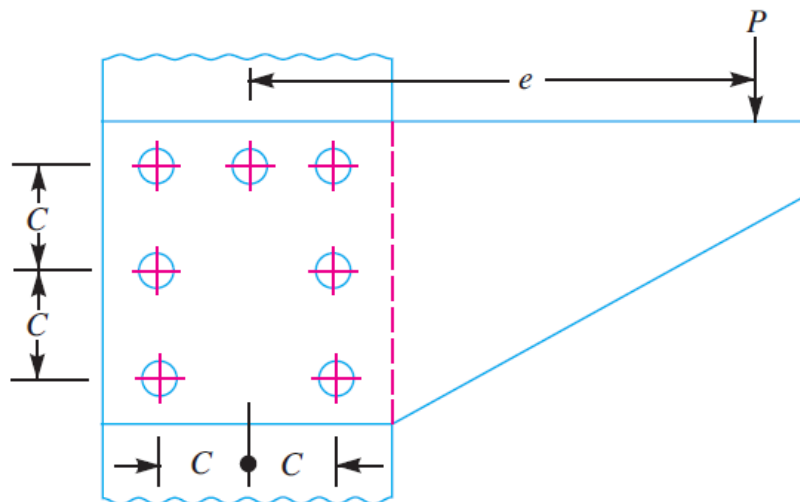
All dimensions in mm.

Figure Q1b

Question 2

An eccentrically loaded lap riveted joint is to be designed for a steel bracket as shown in Figure Q2. The bracket plate is 25 mm thick. All rivets are to be of the same size. Load on the bracket, $P = 50$ kN; rivet spacing, $C = 100$ mm; load arm, $e = 400$ mm. Permissible shear stress is 65 MPa and crushing stress is 120 MPa. Determine the size of the rivets to be used for the joint.

(25 marks)



All dimensions in mm

Figure Q2**Question 3**

Table Q3 shows the data of the journal bearing for a centrifugal pump.

Determine the mass of lubricating oil required for artificial cooling, if rise of temperature of oil be limited to 10°C .

DESCRIPTIONS	DATA
Load on the journal	20,000 N
Speed of the journal	900 rev/min
Absolute viscosity of SAE 10 at 55°C	0.017 kg/m-s
Ambient temperature of oil	15.5°C
Maximum bearing pressure	1.5 N/mm^2
Heat dissipation coefficient	$1232 \text{ W/m}^2/^\circ\text{C}$
Specific heat capacity of oil	$1900 \text{ J/kg/}^\circ\text{C}$

Table Q3

(25 marks)

Question 4

A pair of straight teeth spur gears is to transmit 20 kW when the pinion rotates at 300 rev/min. The velocity ratio is 1:3. The allowable static stresses for the pinion and gear materials are 120 MPa and 100 MPa respectively. The pinion has 15 teeth and its face width is 14 times the module. The tooth form factor y can be taken as:

$$y = 0.154 - \frac{0.912}{\text{No. of teeth}}$$

and the velocity factor C_v as

$$C_v = \frac{3}{3+v} \text{ where } v \text{ is expressed in m/s}$$

Determine,

- (a) Module of the gear, (19 marks)
- (b) Face width, (2 marks)
- (c) Pitch circle diameters of both the pinion and the gear from the standpoint of strength only, taking into consideration the effect of the dynamic loading.

(4 marks)

(Total: 25 marks)

~ The End ~

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