SULIT

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI
KEMENTERIAN PENGAJIAN TINGGI

JABATAN KEJURUTERAAN MEKANIKAL

PENILAIAN ALTERNATIF

SESI DISEMBER 2020

DJJ30103 / DJJ3103 : STRENGTH OF MATERIALS

NAMA PENYELARAS KURSUS : ASRI BIN MAT DESA

KAEDAH PENILAIAN : PEPERIKSAAN ONLINE

JENIS PENILAIAN : SOALAN ESEI BERSTRUKTUR (2 SOALAN)

TARIKH PENILAIAN : 15 JULAI 2021

TEMPOH PENILAIAN : I JAM

LARANGAN TERHADAP PLAGIARISM (AKTA 174)
PELAJAR TIDAK BOLEH MEMPLAGIAT APA-APA IDEA, PENULISAN, DATA ATAU CIPTAAN ORANG LAIN. PLAGIAT ADALAH SALAH SATU PENYELEWENGAN AKADEMIK. SEKIRANYA PELAJAR DIBUKTIKAN MELAKUKAN PLAGIARISM, PENILAIAN BAGI KURSUS BERKENAAN AKAN DIMANSUHKAN DAN DIBERI GRED F DENGAN NILAI MATA 0.
(RUJUK BUKU ARAHAN-ARAHAN PEPERIKSAAN DAN KAEDAH PENILAIAN (Diploma) EDISI 6, JUN 2019, KLAUSA 17.3)

INSTRUCTION:
This section consists of **TWO (2)** structured essay questions. Answer **ALL** questions.

ARAHAN :
*Bahagian ini mengandungi **DUA (2)** soalan esei berstruktur. Jawab **SEMUA** soalan.*

QUESTION 1
SOALAN 1

DJJ30103
(CLO1, C3)

DJJ3103
(CLO1, C3)

A brass bar is 600 mm long, and it is turned on a center lathe to 100 mm diameter. It is held between the chuck jaws and running tailstock. During the turning process, it has become heated from 20^{o}C to 95^{o}C.

Satu bar tembaga mempunya saiz 600mm panjang di kenakan larik tetengah sepanjang bar sehingga mencapai diameter 100mm. Semasa proses melarik dilakukan, suhu meningkat dari 20^{o}C ke 95^{o}C.

Given: E for brass is 90Gpa and α is 18 x 10^{-6} per ^{o}C.
Diberi :E tembaga adalah 90Gpa dan α ialah 18 x 10^{-6} / ^{o}C.

a) Calculate the thermal stress that induces the bar
Kirakan tegasan suhu yang berlaku di dalam bar tersebut.

[15 marks]
[*15 markah*]

b) Calculate the resulting thrust (resulting force) due to the turning process.
Kirakan daya yang dihasilkan yang disebabkan proses melarik tersebut.

[10 marks]
[*10 markah*]

QUESTION 2
SOALAN 2

DJJ 30103
(CLO2, C3)

DJJ3103
(CLO1, C3)

A cantilever beam is 6 m long and has a point load of 800 N at the free end and a uniformly distributed load of 400 N/m along its entire length. Using Double Integration Method:

Sebuah rasuk julur dengan Panjang 6 m dikenakan daya 800 N pada hujung bebas dan di kenakan daya teragih seragam bernilai 400N/m disepanjang rasuk tersebut. Dengan menggunakan kamiran berganda

a) Identify the deflection equation of the beam.
Dapatkan persamaan pesongan rasuk.

[19 marks]
[*19 markah*]

b) Calculate the value of the flexural stiffness (EI) if the deflection is 1.5 mm downwards at the free end.
Hitung nilai kekakuan lenturan (EI) jika pesongan rasuk pada hujung bebas adalah bernilai 1.5 mm arah ke bawah.

[6 marks]
[*6 markah*]

SOALAN TAMAT

LIST OF FORMULA DJJ3103 - STRENGTH OF MATERIALS

FORCES ON MATERIALS

1. Safety factor = $\frac{\text{Maximum Stress}}{\text{Work Stress}}$

2. Poisson's Ratio, ν = $\frac{\text{laterial strain}}{\text{longitudinal strain}}$

3. Percent Elongation = $\frac{\text{Elongation}}{\text{Length}}$ x 100 %

4. Percent reduction in area = $\frac{A_{f-A_o}}{A_o}$ x 100 %

5. Strain Energy, U = $\frac{1}{2}$ PΔL

THERMAL STRESSES AND COMPOSITE BARS

1. Equation of a parallel composite bar subjected to a temperature change.

$$\frac{\sigma_1}{E_1} + \frac{\sigma_2}{E_2} = (\alpha_2 - \alpha_1)\,\Delta t$$

2. Equation of a series composite bar subjected to a temperature change.

$$\frac{P_1 L_1}{A_1 E_1} + \frac{P_2 L_2}{A_2 E_2} = \Delta t\left(\alpha_1 L_1 + \alpha_2 L_2\right)$$

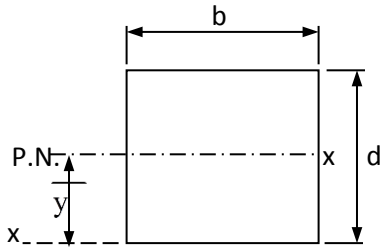
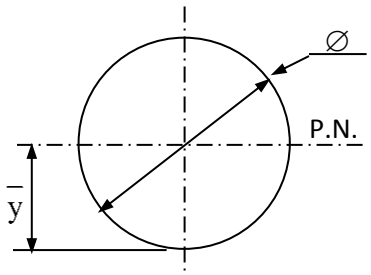
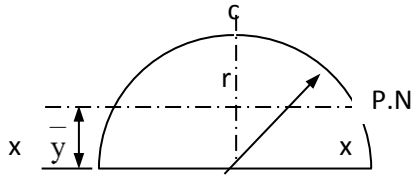
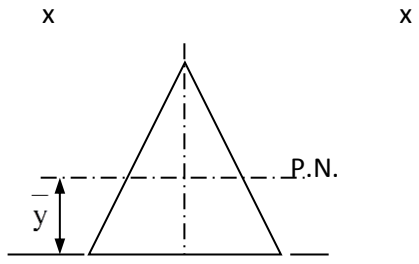
SHEAR FORCES AND BENDING MOMENT

$\sum M_A$ (clockwise) = $\sum M_A$ (anticlockwise)

$\sum F\uparrow$ = $\sum F\downarrow$

BENDING STRESS

$$\frac{M}{I} = \frac{\sigma}{y} = \frac{E}{R}$$

SHAPE	CENTROID	MOMENT OF INERTIA
	$\bar{x} = b/2$ $\bar{y} = d/2$	$I_{P.N.} = \frac{bd^3}{12}$ $I_{xx} = \frac{bd^3}{3}$
	$\bar{x} = d/2$ $\bar{y} = d/2$	$I_{P.N.} = \frac{\pi d^4}{64} = \frac{\pi r^4}{4}$
	$\bar{y} = \frac{4r}{3\pi}$	$I_{P.N} = 0.11 r^4$ $I_{xx} = \frac{\pi r^4}{8}$
	$\bar{y} = h/3$	$I_{P.N.} = \frac{bh^3}{36}$ $I_{xx} = \frac{bh^3}{12}$ $I_{yy} = \frac{hb^3}{48}$

TORSION OF SHAFT

1. TORSION FORMULA

$$\frac{T}{J}=\frac{\tau}{R}=\frac{G\theta}{L}$$

2. POLAR MOMENT OF INERTIA

$$J=\frac{\pi d^4}{32}$$

3. SERIES COMPOSITE SHAFT

$$T=\frac{G_1\theta\, J_1}{L_1}=\frac{G_2\theta_2 J_2}{L_2}$$

$$\begin{aligned}\theta_{AC} &= \theta_{AB}+\theta_{BC}\\ &= \frac{T_1L_1}{G_1J_1}+\frac{T_2L_2}{G_2J_2}\\ &= T\left(\frac{L_1}{G_1J_1}+\frac{L_2}{G_2J_2}\right)\end{aligned}$$

4. PARALLEL COMPOSITE SHAFT

$$T = T_1 + T_2$$

$$\theta=\left(\frac{T_1L_1}{G_1J_1}\right)=\left(\frac{T_2L_2}{G_2J_2}\right)$$