Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2021/2022

COURSE NAME	:	SEDIMENT TRANSPORT
COURSE CODE	:	BFW 40603
PROGRAMME CODE	:	BFF
EXAMINATION DATE	:	JULY 2022
DURATION	:	3 HOURS
INSTRUCTION	1.	ANSWER ALL QUESTIONS
	2.	THIS FINAL EXAMINATION IS AN **ONLINE** ASSESSMENT AND CONDUCTED VIA **CLOSED BOOK.**
	3.	STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK

THIS QUESTION PAPER CONSISTS OF **TEN (10)** PAGES

FINAL EXAMINATION

SEMESTER/SESSION : SEM II / 2021/2022
COURSE NAME : SEDIMENT TRANSPORT
PROGRAMME CODE : BFF
COURSE CODE : BFW40603

TABLE Q1(b): Sieve Analysis Result for Sungai Mersing

No.	Sieve Size (mm)	Weight of Sample (g)
1	5.00	0
2	2	2
3	1.18	18
4	0.6	355
5	0.425	563
6	0.3	428
7	0.212	108
8	0.15	46
9	0.063	11
10	pan	0

TABLE Q3(a): Channel Description

Water Discharge, Q (m^3/s)	60
Channel Slope, S	0.001
Manning's Roughness Coefficient, n	0.015
Median Particle Size, D_{50} (mm)	40
Particle Shape	Slightly Rounded

TABLE Q3(b): Water and Sediment Characteristics of Sungai Muda, Kedah.

Flow discharge, Q	0.6 (m^3/s)
Average velocity, V	0.42 (m/s)
Flow area, A	1.43 (m^2)
Hydraulic radius, R	0.24 (m)
Flow width, B	5.70 (m)
Slope, S	0.0010
Water temperature,	25 (^oC)
Bed load, Q_b	9.48×10^{-6} (m^3/s)
Suspended load, Q_s	9.60×10^{-6} (m^3/s)
Mean diameter, d_{50}	1.1 (mm)
Sediment density, ρ_s	2650 (kg/m^3)
Sediment specific gravity, γ_s	2.650
$[(\gamma_s/\gamma) - 1]$	1.650
Gravity acceleration, g	9.81 (m/s^2)
Kinematic viscosity, ν	1.0 x 10-6 (m^2/s)
Shape factor, SF	0.7

FINAL EXAMINATION

SEMESTER/SESSION : SEM II / 2021/2022
COURSE NAME : SEDIMENT TRANSPORT
PROGRAMME CODE : BFF
COURSE CODE : BFW40603

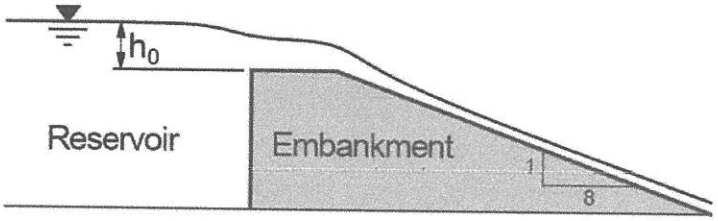


FIGURE Q2(b)(i): Downstream Slope of the Embankment

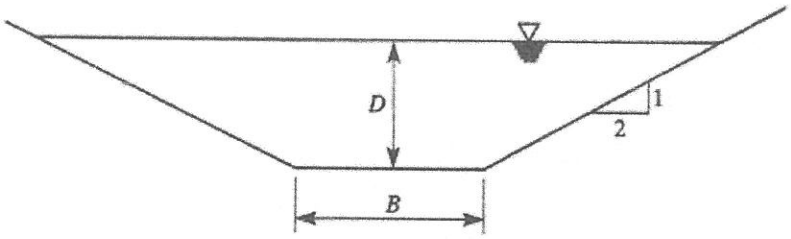


FIGURE Q3(a): The Channel Measurement

FINAL EXAMINATION

SEMESTER/SESSION : SEM II / 2021/2022
COURSE NAME : SEDIMENT TRANSPORT
PROGRAMME CODE : BFF
COURSE CODE : BFW40603

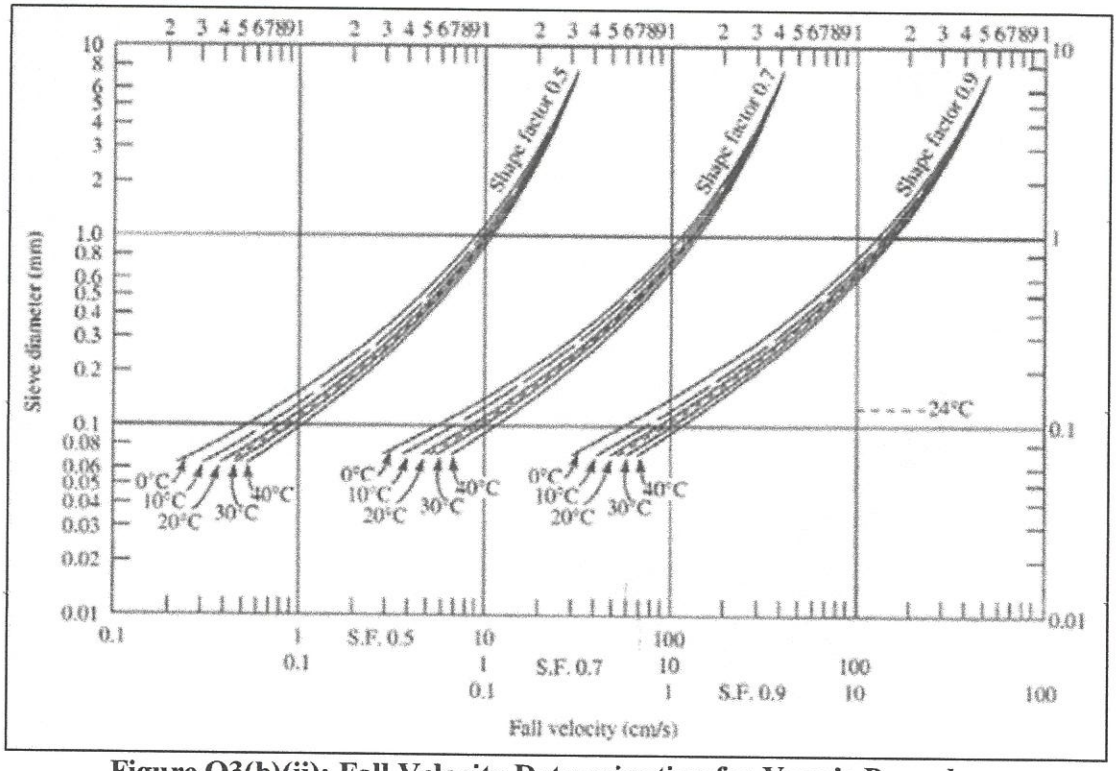


Figure Q3(b)(ii): Fall Velocity Determination for Yang's Procedure

FINAL EXAMINATION

SEMESTER/SESSION	: SEM II / 2021/2022	PROGRAMME CODE	: BFF
COURSE NAME	: SEDIMENT TRANSPORT	COURSE CODE	: BFW40603

The following information may be useful. The symbols have their usual meaning.

So = 0.0009

Lacey equation

$V = 10.8\ R^{2/3}\ So^{1/3}$

For wide channel

$V = 10.8\ yo^{2/3}\ So^{1/3}$

$q = V\ yo$

Normal Depth

$q = Vh$, where $V = \frac{1}{n} R_h{}^{2/3} S^{1/2}$, $R_h = h$ (Wide channel)

$q = \frac{1}{n} h^{5/3} S^{1/2}$

Bed shear stress

For normal flow;

$\tau = \rho g R_h S$, where; $R_h = h$ (wide channel)

For bed material

$$d^* = d\left[\frac{(s-1)g}{\nu^2}\right]^{1/3}$$

$$\tau^*_{crit} = \frac{0.30}{1+1.2d^*} + 0.055\ [1 - \exp(-0.020d^*)]$$

$$\tau^* = \frac{\tau}{(\rho_s - \rho)gd}$$

Einstein Method

$$V = 5.75U'_* log\left(12.27\frac{R'}{k_s}x\right);\ k_s = d_{65};\ U'_* = (gR'S)^{1/2}$$

$$\delta = \frac{11.6\nu}{U'_*};\ \frac{k_s}{\delta} = \frac{0.0009(R')^{1/2}}{1.31\times10^{-4}}$$

$$U''_* = \left(\frac{V}{U''_*}\right)^{-1} V$$

$$R'' = \frac{(U''_*)^2}{gS} = \frac{(U''_*)^2}{0.0078}$$

$$\psi' = (2.65-1)\frac{d_{35}}{SR'}$$

FINAL EXAMINATION

SEMESTER/SESSION	: SEM II / 2021/2022	PROGRAMME CODE	: BFF
COURSE NAME	: SEDIMENT TRANSPORT	COURSE CODE	: BFW40603

The following information may be useful. The symbols have their usual meaning.

Yang's Equation

$$\log C_T = 5.435 - 0.286\log\frac{W_S d_{50}}{\nu} - 0.457\log\frac{U_*}{W_S} + \left(1.799 - 0.409\log\frac{W_S d_{50}}{\nu} - 0.314\log\frac{U_*}{W_S}\right)\log\left(\frac{VS}{W_S} - \frac{V_c S_o}{W_S}\right)$$

$$\frac{V_c}{W_S} = \frac{2.5}{\log\left(\frac{U_* d_{50}}{\nu}\right) - 0.06} + 0.66 \quad \text{for} \quad 1.2 < \frac{U_* d_{50}}{\nu} < 70$$

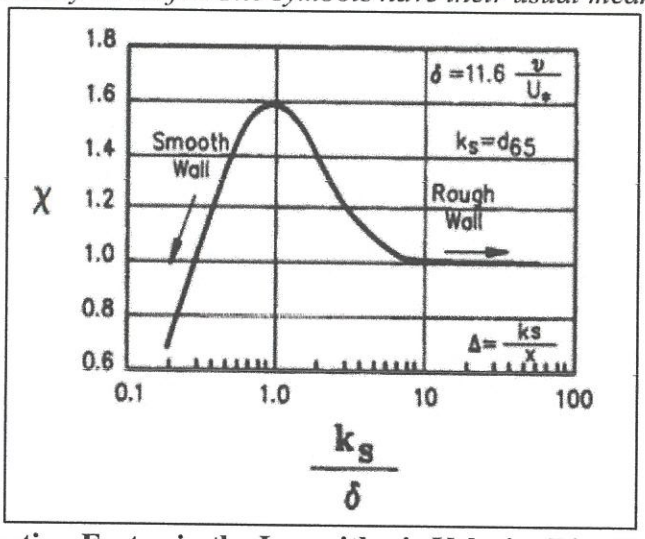
$$\frac{V_c}{W_S} = 2.05 \quad \text{for} \quad 70 \le \frac{U_* d_{50}}{\nu}$$

$$C_v(\text{ppm}) = \frac{C_T(\text{ppm})}{\gamma_s/\gamma}$$

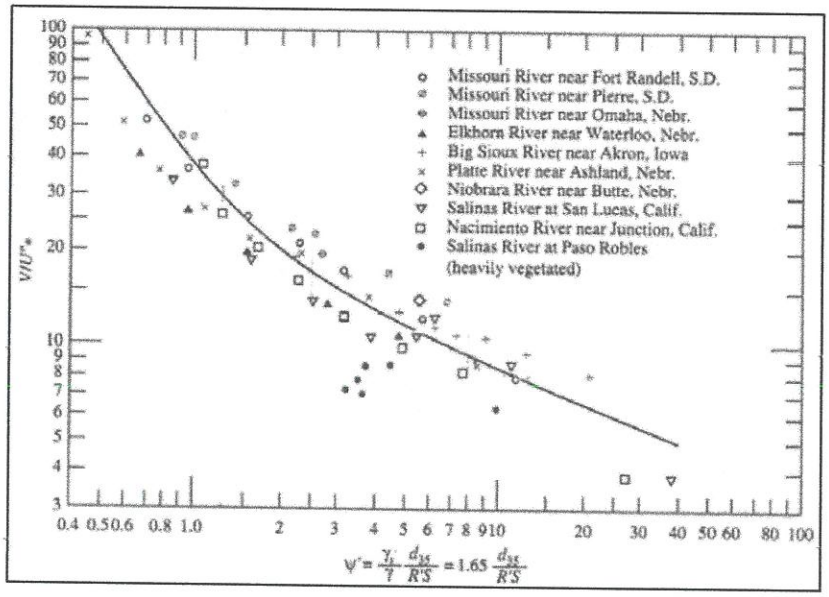
FINAL EXAMINATION

SEMESTER/SESSION : SEM II / 2021/2022
COURSE NAME : SEDIMENT TRANSPORT
PROGRAMME CODE : BFF
COURSE CODE : BFW40603

The following information may be useful. The symbols have their usual meaning.



Correction Factor in the Logarithmic Velocity Distribution



Friction Loss due to Channel Irregularities as a Function of Sediment Transport Rate (Einstein and Barbarossa, 1952)

FINAL EXAMINATION

SEMESTER/SESSION : SEM II / 2021/2022
COURSE NAME : SEDIMENT TRANSPORT
PROGRAMME CODE : BFF
COURSE CODE : BFW40603

The following information may be useful. The symbols have their usual meaning.

Degree of sinuousness	Correction factor
Straight channels	1.00
Slightly sinuous channels	0.90
Moderately sinuous channels	0.75
Very sinuous channels	0.60

Correction Factor for Maximum Tractive Force