FINAL
ALTERNATIVE ASSESSMENT

(COVER PAGE)

Session	:	**August 2021**
Programme	:	Diploma in Mechanical Engineering (DMEN)
Course	:	**EGR2180: Fluid Mechanics 2**
Date of Examination	:	8 December 2021 (Wednesday)
Time	:	8.00am – 10.30am Reading Time : Nil
Duration	:	2 Hours 30 Minutes

Special Instructions :

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

Material permitted :

Non-Programmable Scientific Calculator

Materials provided :

Nil

Examiner(s)	:	**Mohd Faiz Osrin**
Chief Moderator	:	Nur Hafizah Habideen

*This paper consists of **5** printed pages, including the cover page*

DIPLOMA IN MECHANICAL ENGINEERING PROGRAMME (DMEN)
EGR2180: FLUID MECHANICS 2
FINAL ALTERNATIVE ASSESSMENT: AUGUST 2021 SESSION

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

Question 1

(a) A circular channel has diameter of 3 m. Water flows at 10°C in a half-full of the channel at an average velocity of 2.5 m/s. Determine

(i) the hydraulic radius,

(4 marks)

(ii) the Reynolds number,

(4 marks)

(iii) the flow regime

(2 marks)

(b) Figure Q1(b) shows that water flows in a channel with the bottom slope of 0.002. The cross section, dimensions and the Manning coefficients for the surfaces of different subsections are given in the figure. Determine

(i) the flow rate through the channel

(11 marks)

(ii) the effective Manning coefficient for the channel.

(4 marks)

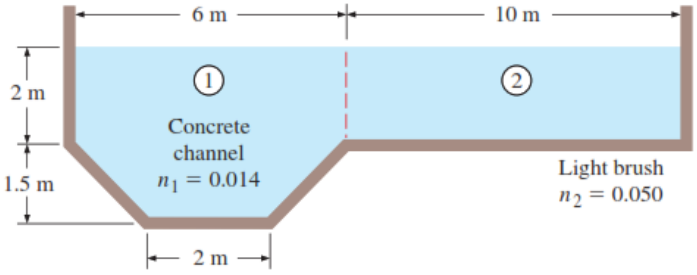

Figure Q1(b)

Question 2

(a) Figure Q2(a) shows a rectangular horizontal channel with a width of 8 m. The flow of water discharge from a sluice gate has undergone a hydraulic jump. The flow depth and velocity before the jump are 1.2 m and 9 m/s respectively. Determine

(i) the flow depth and the Froude number after the jump,

(4 marks)

(ii) the head loss and the dissipation ratio,

(4 marks)

(ii) the mechanical energy dissipated by the hydraulic jump.

(5 marks)

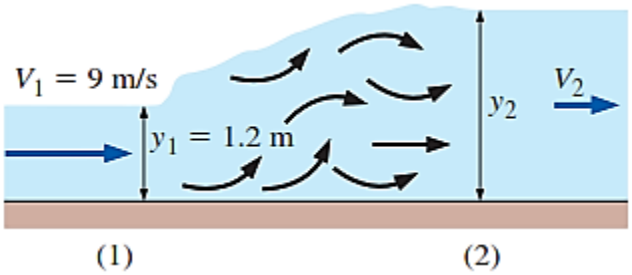

Figure 2 Q2(a)

(b) Figure Q2(b) shows 0.80-m-high broad-crested weir is used to measure the flow rate of water in a 5-m-wide rectangular channel. The flow depth before the weir is 1.8 m. Determine

(i) the flow rate through the channel,

(8 marks)

(ii) the minimum flow depth above the weir.

(4 marks)

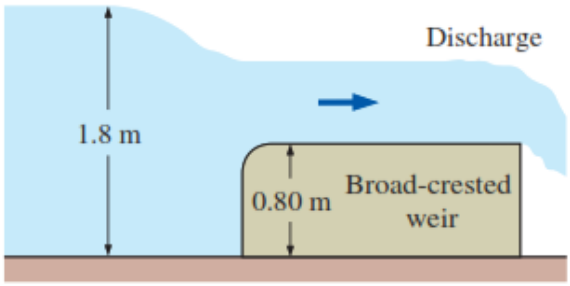

Figure Q2(b)

Question 3

Figure Q3 shows a single suction centrifugal pump designed to transfer fluids in industrial operation. The rotation of impeller blades at 1200 rev/min produce a flow of 0.03 m^3/s. Determine

(i) the speed of the water as it exits the blades

(17 marks)

(ii) the ideal power

(4 marks)

(iii) the ideal head produced by the pump.

(4 marks)

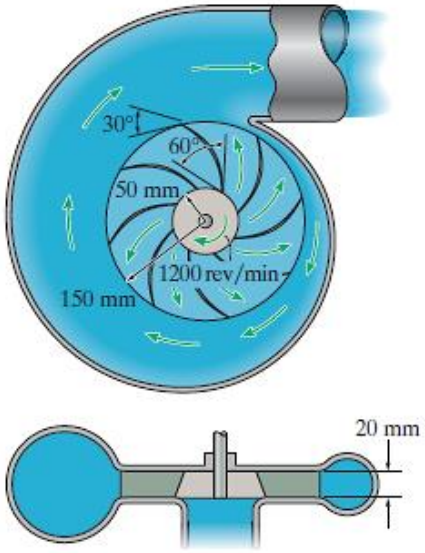

Figure Q3

Question 4

Figure Q4 shows the design of hydroturbine used at the hydroelectric power station. The dimension of each components shown in the figure are r_2 = 2 m, r_1 = 1.42 m, b_2 = 0.731 m, and b_1 = 2.20 m.. The wicket gates turn the flow by angle α_2 = 30° from radial at the runner inlet, and the flow at the runner outlet is at angle α_1 = 10° from radial. The runner rotates at n=180 rpm with volume flow rate at design conditions is 340 m^3/s. The gross head provided by the dam is H_{gross} = 90.0 m. Determine

(i) the inlet and outlet runner blade angles β_1 and β_2,

(17 marks)

(ii) the power output,

(4 marks)

(iii) the net head.

(4 marks)

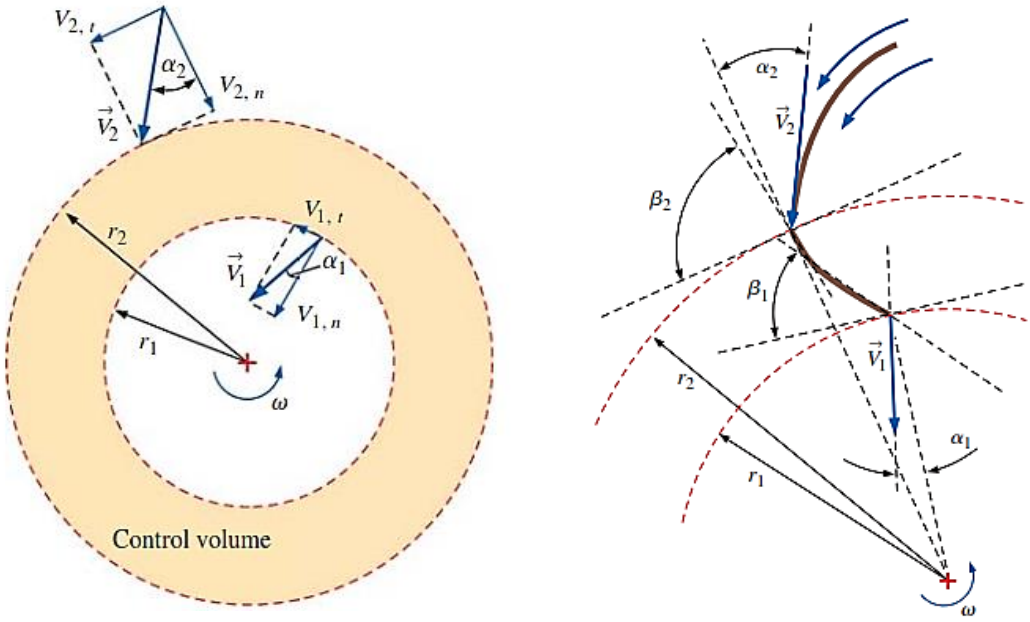

Figure Q4

~THE END~