



Answer the following questions- use neat sketches - assume any missing data.

Question (1) (30 marks)

- a. A canal whose bottom width is 20 ms., side slopes 2:1 passing a discharge of 200 m³/s. the normal water depth is 4.0 ms the canal is lined with concrete for which (1/n=80). Determine: (20 marks)
- 1) The grade of the canal in cm/km, (5 marks)
 - 2) If Q=100 instead of 200 m³/s, find the corresponding water depth, (5 marks)
 - 3) Calculate the discharge if s₀ is doubled, (5 marks)
 - 4) Calculate the discharge if n is doubled. (5 marks)
 - 5) A special sewer consists of a semicircular top and bottom of radius (r) joined by parallel vertical sides of length (r) so that the total height is (3r).....(10 marks)
 - 6) Show that for max. discharge the angle subtended by the water surface at the center of curvature of the upper semicircle is approximately 64°. (5 marks)
 - 7) If the upper surface is raised until it reached the top of the sewer, find the percentage decrease in flow. (5 marks)

Question (2) (20 marks)

If the velocity distribution for turbulent flow over rough open channel surfaces is represented by :
 $U = 5.75 U_* \log (30y/k)$,

It is required to :

- 1) Prove that: $\epsilon = 14.2/C = 0.883(f)^{1/2} = 9.50 n/R^{1/6} \rightarrow$ In which $\epsilon = 2.5 U_* / v$, $v =$ mean velocity (5 marks)
- 8) Derive an expression for the mean velocity at a vertical section (v_m) and give the height above the bed at which it occurs. (5 marks)
- 9) Compare the expressions you get in (2) with the mean of the velocities 0.20 and 0.80 of the water depth. (5 marks)
- 10) Show that $\epsilon = U_{max} / V_m - 1$ (5 marks)

Question (3) (15 marks)

In a river of bed width of 600 ms. and bed slope of 7.5 cm/km. it is found that the bed material just begin to move when the discharge is 120 million m³/day. Assuming the mean velocity to vary with the water depth and slope according to the relation: $V = 120 y. s^{2/3}$, find the bed slope at which the same tractive force on the bed would be produced with a discharge of 365 million m³/day.

Question (4) (35 marks)

- 1) A uniform flow of depth 1.50 ms occurs in a long rectangular channel of 20 ms. width, having a Manning's n of 0.012 and laid on a slope of 0.0016. Calculate the following;(15 marks)
 - a) The min. height of a hump which can be built in the floor of this channel a cross the flow to produce min. specific energy , Evaluate E_{min} . (5 marks)
 - b) The max. contraction which can produce by itself min. specific force, Evaluate F_{min} . (5 marks)
 - c) Compare between the two cases (a), (b) by stating two main differences. (5 marks)
- 2) A trapezoidal channel of bed width 10.0 ms. and side slopes of 1:1, conveys a discharge of 100 m³/s the water depth is 1.50ms determine;(20 marks)
 - a) Can a hydraulic jump take place, (5 marks)
 - b) The sequent depth, (5 marks)
 - c) The power corresponding to loss in kinetic energy through jump, and (5 marks)
 - d) The energy dissipated in H.P (5 marks)

With our best wishes

This exam measures the following ILOs

Question Number	Q1	Q2	Q4	Q2	Q3	Q4	Q2	Q3	Q4
	A2	A5	A2	B1	B5	B2	C2	C1	C6
Skills	Knowledge & Understanding Skills			Intellectual Skills			Professional Skills		