Hydraulic Structure

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Section: (C

Assignment No.1

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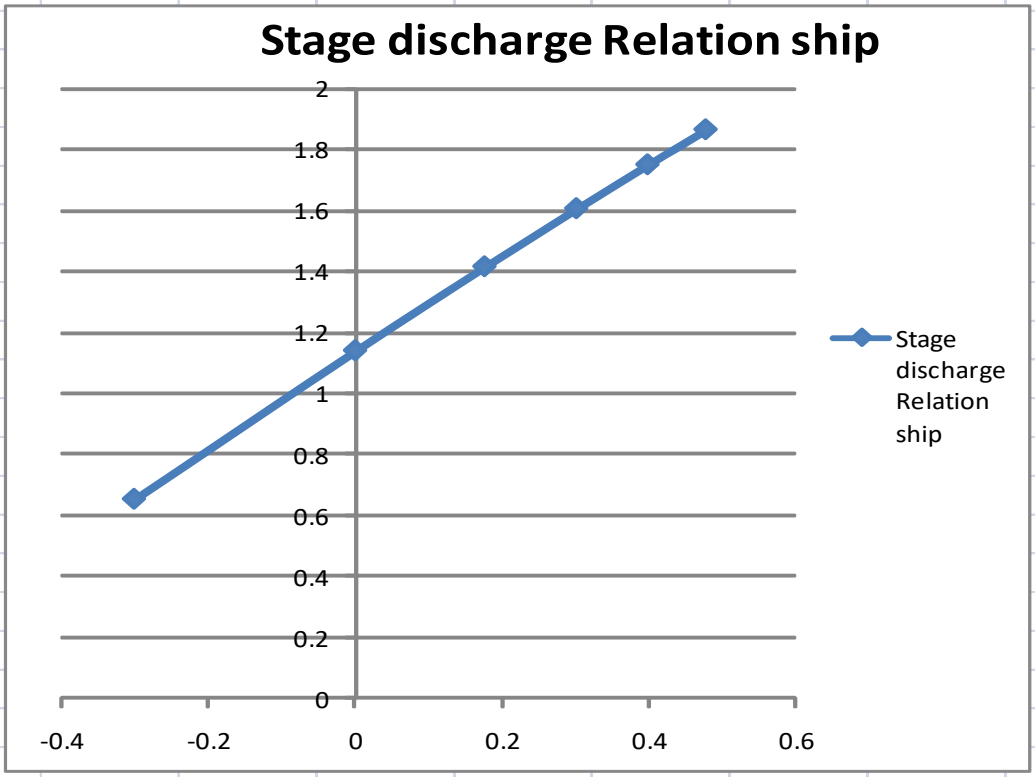
Q 1) Establish the stage discharge relationship for a concrete rectangular box culvert use suitable data of your own choice

Q 2) Also describe loads on bridge foundation due to scour and their working mechanism.

QNO 1:

Answer:

Q(ft^3/s)		log d	log Q
4.5		-0.30103	0.653213
13.81		0	1.140194
26.03		0.176091	1.415474
40.35		0.30103	1.605844
56.21		0.39794	1.749814
73.21		0.477121	1.86457



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QNO 2:

Answer:

Scour of sediments around bridge foundations by the stream is the most significant factor for bridge failures. The scour failures tend to occur without prior warning and have led to fatalities and economic loss every year. A significant amount of work has been conducted on bridge scour. It can be classified into two major categories, namely science driven and engineering driven.

The science-driven research focuses on understanding the scour mechanism and aims to explain the cause of scour due to different factors, while engineering-driven research focuses on the estimation, monitoring and countermeasures of bridge scour. Scour occurs in three main forms, namely, general scour, contraction scour and local scour. General scour occurs naturally in river channels and includes the aggradation and degradation of the river bed that may occur as a result of changes in the hydraulic parameters governing the channel form such as changes in the flow rate or changes in the quantity of sediment in the channel. It relates to the evolution of the waterway and is associated with the progression of scour and filling, in the absence of obstacles. Contraction scour occurs as a result of the reduction in the channel's cross-sectional area that arises due to the construction of structures such as bridge piers and abutments. It manifests itself as an increase in flow velocity and resulting bed shear stresses, caused by a reduction in the channel's cross-sectional area at the location of a bridge. The increasing shear stresses can overcome the channel bed's threshold shear stress and mobilize the sediments. Local scour occurs around individual bridge piers and abutments. Downward flow is induced at the upstream end of bridge piers, leading to very localized erosion in the direct vicinity of the structure. Horseshoe vortices develop due to the separation of the flow at the edge of the scour hole upstream of the pier and result in pushing the down-flow inside the scour hole closer to the pier. Horseshoe vortices are a result of initial scouring and not the primary cause of scour. Furthermore, separation of the flow at the sides of the pier results in wake vortices. Local scour depends on the balance between streambed erosion and sediment deposition.

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