**Objective Questions:-**

1. Examples of channel transitions are
   a) contractions
   b) expansions
   c) bends
   d) All of the above

2. Flow developed due to sudden transition is
   a) Gradually varied flow
   b) Spatially varied flow
   c) Rapidly varied flow
   d) Uniform flow

3. Following factors affect the flow through culvert
   a) Geometry
   b) Bottom slope
   c) Tail water conditions
   d) All of the above

4. Flow through culvert is
   a) Upstream controlled
   b) Downstream controlled
   c) Both
   d) None of the above

5. When the culvert is partially full, the flow will be
   a) Subcritical
   b) Supercritical
   c) Critical
   d) Uniform
At a bridge site the flow will not choke if

\[ z_{BB} + E_{BB} = z_{BB} + z_{crit} \]

\[ z_{BB} + E_{BB} < z_{BB} + z_{crit} \]

\[ z_{BB} + E_{BB} > z_{BB} + z_{crit} \]

d) All of the above

Where BB is the bridge section.

Answers:-

1(d)  2(c)  3(d)  4(c)  5(a)  6(c)
Subjective Questions

1. What do you mean by sudden transition in an open channel explain with sketch.

2. What are Culverts. What they are used for.

3. Differentiate between inlet controlled and outlet controlled culverts.

4. Write down the difference between the flow through obstructions and flow through bridge.

5. A 2m wide rectangular channel carries a discharge of 15 cumec at a depth of 2.5m. There is a step rise of 0.1m in the channel bottom. Assuming there is no losses in the transition; determine the flow depth downstream of the bottom step. (Ans. 1.41m and 2.31m).

6. A discharge of 2.0 cumec flows through a rectangular box culvert having D=1.5m, b=1.0m, L=40m, n=0.013, and S=0.002. Outlet of the culvert is submerged with the tail water head of 1.5m. Determine the headwater depth. Take $k_e=0.5$. (Ans. 1.795m)
References:

4. Formica G. 1955. Esperienze preliminari sulle perdite di carico nei canali dovute a cambiamenti di sezione (Preliminary tests on head losses in channels due to cross sectional changes), L'Energia Ellettria, Milan 32 no. 7 (July):554.