Time: Three hours   Full Marks: 70

Figures in the margin indicate full marks
Candidates are allowed to consult any resource materials like books and class notes.

Answer Q. No. 5 and any three from the rest

1. Design a vertical drop weir on the basis of Bligh's theory for the following data and also draw a neat sketch of the weir. (20)

   i)   Maximum flood discharge = 1500 cumec
   ii)   H.F.L. before construction of weir = 200m
   iii) River bed level = 180 m
   iv)   F.S.L. of canal = 185m
   v)   Allowable afflux = 1.2m
   vi)   Coefficient of creep = 11
         Test the floor of the weir by Bligh's theory.

2. The following data of a glacis weir was obtained : (20)

   i)   Maximum discharge intensity on weir crest = 27 cumec/m
   ii)   H.F.L. before construction of weir = 180m
   iii) River bed level = 170m
   iv)   Pond level = 178m
   v)   Height of crest shutters = 2m
   vi)   Downstream water level in the river when the weir is discharging with pond level upstream = 175m
   vii) Bed retrogression = 0.5m
   viii) Lacey's silt factor = 0.85
   ix)   Permissible exit gradient = 1/7
   x)   Permissible afflux = 1.5m

   Calculate the length of impervious floor and elevation of subsoil hydraulic gradient line for different conditions. Also plot the hydraulic gradient line.

3. Design the waterway and impervious floor of a cross regulator for a distributary taking off from a branch canal: (20)
   i)   Discharge of branch canal = 175 cumec
   ii)   Discharge of distributary = 40 cumec
   iii) F.S.L. of branch canal : u/s = 115.5 m
   iv)   F.S.L. of branch canal d/s = 115 m
   v)   Bed width of branch canal : u/s = 55m
   vi)   Bed width of branch canal : d/s = 49 m
   vii) Depth of water in the branch canal : u/s and d/s both = 3.8m
   viii) F.S.L. of distributary = 112m
   ix)   Bed width of distributary = 20m
   x)   Depth of water in the distributary = 2.5m
   xi)   Permissible exit gradient = 1/6

4. Design a Sarda type fall for the following data: (20)
   i)   Full supply discharge: u/s and d/s both = 20 cumec
   ii)   Full supply level :u/s =215.4 m
   iii)   Full supply level:d/s = 214.0 m
   iv)   Full supply depth: u/s and d/s both = 2.0 m
   v)   Bed width: u/s and d/s both = 20 m
   vi)   Bed level: u/s = 213.4 m
   vii) Bed level: d/s = 212.0 m
   viii) Drop = 1.2m

   Design the floor on the basis of Bligh's theory taking coefficient of creep = 10. Check the design by Khosla's theory and modify if necessary. Safe exit gradient may be taken as 1/5.

5. (10)
   a) What is the importance of exit gradient? How would you check it?
   b) What is the utility of launching apron? How is it designed?