

This question paper contains 8 printed pages]

HPAS (M)—2014

CIVIL ENGINEERING

Paper II

Time : 3 Hours

Maximum Marks : 150

Note :— (i) Question No. 1 is compulsory. Attempt any *four* questions out of the remaining questions. In all *five* questions are to be attempted.

(ii) Assume suitable data, if required.

1. (a) State the advantages and disadvantages of plane tabling. What are the various methods of plane tabling ? Explain with neat sketches. 10

(b) A circular curve has a 200 m radius and 65° deflection angle. Calculate length of curve, tangent length, length of long chord, apex distance and mid ordinate. 10

P.T.O.

- (c) The following observations were taken during the testing of a dumpy level :

10

Instrument at	Staff Reading at	
	A	B
A	1.275	2.005
B	1.040	1.660

Is the instrument in adjustment ? To what reading should the line of collimation be adjusted when the instrument is at 'B'. If 'A' and 'B' were 100 m apart, what is the angle of inclination of the line of collimation ?

2. (a) A vertical summit curve is to be designed when two grades, $+1/50$ and $-1/80$, meet on a highway. The stopping sight distance and overtaking sight

distance required are 180 and 640 m respectively.

But due to site conditions the length of vertical curve has to be restricted to a maximum value of 500 m, if possible. Calculate the length of summit curve needed to fulfil the requirements of :

(i) Stopping sight distance

(ii) Overtaking sight distance, or

(iii) At least intermediate sight distance and discuss the results. 10

(b) What are the steps for thickness design of rigid pavement as per IRC guidelines ? 10

(c) Explain the procedure of conducting penetration test on a bituminous sample. 10

P.T.O.

3. (a) A turn out in a straight BG railway track is to be laid off with a 1 in 12 crossing. Determine the lead and the radius of turn out.

Data given :

heel divergence (d) = 133 mm, crossing angle (α) = $4^{\circ}45'49''$, switch angle (β) = $1^{\circ}8'00''$, straight arm between theoretical nose of crossing and the tangent point of crossing

$x = 1.418$ m. 10

(b) Explain the function of sleepers and ballast in a railway track. 10

(c) Discuss in brief the causes and effects of creep in a railway track. 10

4. (a) A laminar flow is taking place in a pipe of diameter 0.2 m. The maximum velocity is 1.5 m/sec. Find the mean velocity and the radius, at which this occurs. Also calculate the velocity at 0.04 m from the wall of the pipe. 10

(b) Define the following and give *one* practical example of each :

Laminar flow, turbulent flow, unsteady flow, and uniform flow. 10

(c) Derive an expression for the loss of head due to friction in the pipes. 10

P.T.O.

5. (a) The depth of flow in a hydraulically most efficient trapezoidal channel (side slopes 1.5H : 1V and manning's, $n = 0.015$) is to be restricted to 1.6 m for its design discharge of $15 \text{ m}^3/\text{sec}$. Determine the bed slope of the channel. 10
- (b) Write a descriptive note on hydraulic jump on slopping channels. 10
- (c) How would you estimate the losses in an unlined irrigation channel ? What are the objects of canal lining ? 10
6. (a) How the stability analysis of a gravity dam is carried out ? Describe. 10
- (b) Define precipitation. Describe the various forms and various types of precipitation. 10
- (c) What is a unit hydrograph ? Draw a unit hydrograph and explain the salient features. 10

7. (a) A channel carrying $2\frac{1}{2}$ cumec of water is able to command 1620 ha of cultivated land with intensity of irrigation 50% and the base period of crop is 140 days. In another system a distributary is carrying 0.6 cumec water and is capable of irrigating 240 ha of land with the same base period. Compare the duties of the two systems and state which system is using water more economically ? 10
- (b) Compute the population of the year 2000 and 2006 for a city whose population in the year 1930 was 25000 and in the year 1970 was 47000. Make use of geometric increase method. 10
- (c) Discuss how a slow sand filter differs from a rapid sand filter. 10

8. (a) Explain the significance of the following from the point of water quality criteria : 15

(i) Turbidity

(ii) Chlorides

(iii) Nitrates

(iv) Sulphate and

(v) Iron.

(b) Give the flow diagram for the activated sludge process and describe the working of activated sludge plant. 15