CSM – 19/20

Civil Engineering

Paper – II

Time : 3 hours

Full Marks : 300

The figures in the right-hand margin indicate marks.

*Candidates should attempt Q. No. 1 from Section – A and Q. No. 5 from Section – B which are compulsory and any **three** of the remaining questions, selecting at least **one** from each Section.*

SECTION – A

1. Answer any **three** of the following :

   (a) What do you mean by FRP concrete ? What are the key physical characteristics of FRP concrete that define its special properties ? List few applications of FRP concrete.

   6+8+6 = 20

(b) (i) Explain, in detail, the procedure for determining the compressive strength of bricks as per I. S. code. 10

(ii) What are the different factors affecting the selection of flooring materials ? 10

(c) Two stations P and Q have elevations of 200 m and 995 m, respectively. The distance of Q from P is 105 km. If the elevation of a peak R at a distance of 38 km from P is 301 m, determine whether Q is visible from P or not. If not, what would be the height of scaffolding required at Q so thet Q becomas visible from P. 20

(d) Calculate the extra width of the pavement required on a horizontal curve of radius 700 m on a two lane highway, the design speed being 80 kmph. Assume wheel base length of 6 m. 20

2. (a) Enlist and explain time estimates in PERT. Explain Resources Allocation. 15+5 = 20

(b) Explain various steps involved in the development of networks. 20

(c) A typical candidate in an examination take no less than 22 minutes to answer a question and sometimes as much as 44 minutes, 30 minutes times are most frequent than any other time. If this performance were an activity in a PERT project, estimate : (i) this would be expected time to answer a question, (ii) its variance, and (iii) the time to be allocated for answering a question in scheduling the project. 20

3. (a) The speed-density relationship for a given section of road is given by $u = 53 - 0.43\,k$, where 'u' is the speed in kmph and 'k' is the density in vehicle/km. Find the capacity of the road (maximum flow). Also find the mean (c)

speed and mean density. Plot the variation of capacity with varying density and comment on the traffic flow parameters. 30

(b) What is super-elevation ? What are the factors affecting super-elevation ? Find the maximum speed of a train on a B.G. track having a curvature of 3 degrees and a super-elevation of 10 cm. Assume allowable cant deficiency as 75 mm. 5+10+15 = 30

4. (a) Design an irrigation canal of trapezoidal section with 1 : 1 side slope, on non-alluvial soil for a discharge of 24 cumec. The permissible mean velocity is 0.8 m/s and the bed slope is 1 in 5000. Chezy's constant = 44. 30

(b) Briefly classify Aquifers. Find the diameter of an open well for a required discharge of 3 lts/s. The depression head is 3m and specific yield is $1 m^3/hr/m^2$. 5+25 = 30

SECTION – B

5. Answer any **three** of the following :

   (a) Explain, in detail, the purpose and working of slow sand filters with neat sketch. Find the area of slow sand filters required for a town having a population of 15000 with an average rate of demand as 160 litres per head per day. 15+5 = 20

   (b) A city has a population of 50000. It is to be supplied with water at 250 litres per head per day. Calculate the BHP of motor to raise the water to an overhead tank 60 m high. The length and diameter of the rising main are 300 m and 30 cm respectively. The efficiency of motor is 95% and that of pump is 60%. Assume the coefficient of friction to be 0.04 and peak hour demand as 1.5 times the average demand. 20

Explain the advantages and disadvatages of traffic signs. Distinguish between fixed signal and vehicle actuated signal. 20

(d) What is Hydrograph ? Explain the different types of hydrograph with their application. 20

6. (a) Show the sequence of various treatment units of a typical water treatment plant with Perennial River as the source of water. List these treatment units sequentially. 30

(b) Calculate the velocity, discharge and Chezy's coefficient for a stoneware sewer running full. The diameter of sewer is 150 mm and it is laid at a gradient of 1 in 60. Assume N = 0.013 in Manning's formula. 30

7. (a) Design a primary clarifier for a town having a population of 35000. The formation of sewage may be assumed at 150 litres per capita per day. 30

(b) What do you mean by the term activated sludge ? Draw a flow diagram to show the activated sludge process. List different methods of sludge disposal and explain any two of them. 5+10+15 = 30

8. (a) Explain briefly the environmental impact assessment of Wastewater Treatment Projects. 20

(b) Why are origin and destination studies conducted for a road ? Describe briefly suitable methods for conducting these studies. 20

(c) What are the advantages of Traffic-Rotary ? Differentiate between Bituminous Concrete and Bituminous Macadam. 10+10 = 20