C-HENT-N-BDUFB

CIVIL ENGINEERING

Paper – II

*Time allowed : **Three** Hours* | *Maximum Marks : **200***

Question Paper Specific Instructions

Please read each of the following instructions carefully before attempting questions :

*There are **EIGHT** questions in all, out of which **FIVE** are to be attempted.*

*Questions no. **1** and **5** are compulsory. Out of the remaining **SIX** questions, **THREE** are to be attempted selecting at least **ONE** question from each of the two Sections **A** and **B**.*

Attempts of questions shall be counted in chronological order. Unless struck off, attempt of a question shall be counted even if attempted partly. Any page or portion of the page left blank in the Question-cum-Answer Booklet must be clearly struck off.

All questions carry equal marks. The number of marks carried by a question/part is indicated against it.

*Answers must be written in **ENGLISH** only.*

Unless otherwise mentioned, symbols and notations have their usual standard meanings.

Assume suitable data, if necessary and indicate the same clearly.

Neat sketches may be drawn, wherever required.

SECTION A

Q1. (a) Enlist the most common defects in timber. Explain how they occur. *8*

(b) Draw a neat sketch of dragline showing the various components. Explain its working and uses. *8*

(c) (i) A pentagon ABCDEA was run clockwise in a traverse survey. If the FB of line AB is 90°, calculate the fore bearings of the remaining lines. *4*

(ii) What are the functions of providing rails in a track ? How is the weight of a rail section usually determined ? *4*

(d) Calculate the design traffic in MSA and CVD requied for design of flexible pavement in rural areas as per revised IRC procedure for the following data : *8*

Annual average daily commercial vehicle at last count (July 2014) = 150

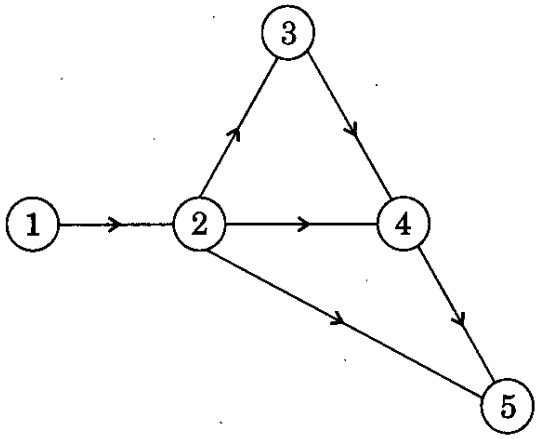
Rate of traffic growth = 6%

Design life = 10 years

Vehicle damage factor = 1·5

The road is proposed to be completed in July 2017.

(e) For a network shown in figure, normal time, crash time, normal cost and crash cost are given in the table. Contract the network crashing it to optimum value and calculate the optimum project cost. Indirect cost is given as ₹ 100 per day. *8*



	NORMAL		CRASH	
Activity	Time in days	Cost in ₹	Time in days	Cost in ₹
1 – 2	3	300	2	400
2 – 3	6	480	4	520
2 – 4	7	2100	5	2500
2 – 5	8	400	6	600
3 – 4	4	320	3	360
4 – 5	5	500	4	520

Q2. (a) (i) What are the requirements of a good highway drainage system ? Discuss. *10*

(ii) What is contour gradient ? Explain the procedure of locating contour gradient. *5*

(iii) Explain the method of planing of concrete by concrete pumps. *5*

(b) A road transition between two straights consists of a pair of clothoid spirals meeting at a common point, the second straight deflecting to the right at an angle of 19° 6′ and a running distance of 360 metres. The curve is to be designed for a maximum speed of 110 km per hour, a limiting centrifugal ratio of 1/4 and a maximum rate of change of radial acceleration of 30 cm per square second in a second. Calculate the lengths of spirals and the radius of the curve at the point of compound curvature. *10*

(c) A 6° curve branches off from a 3° main curve in opposite direction in the layout of a B.G. yard. If the speed on the branch line is limited to 35 km per hour, determine the maximum permissible speed on the main line using both Cant formula and Railway Board formula. *10*

Q3. (a) The traffic flow in an urban section at the intersection of two highways in the design year are given below :

Approach	Left Turning			Straight Ahead			Right Turning		
	Cars	Commercial	Scooters	Cars	Commercial	Scooters	Cars	Commercial	Scooters
North	200	50	100	250	100	150	150	50	80
East	180	60	80	220	50	120	200	40	120
South	250	80	100	150	50	90	160	70	90
West	200	50	120	180	60	100	250	60	100

The highways with carriageway width of 15 m at present intersect at right angles and rotary intersection is proposed. Compute the traffic flow from and on each leg in the rotary and draw the schematic traffic flow diagrams. *10*

(b) Explain the causes of failure of foundations and their remedial measures. *10*

(c) In a triangulation survey the altitudes of two proposed triangulation stations A and B 100 km apart are respectively 400 m and 630 m. The intervening obstruction situated at C, 68 km from A has an elevation of 415 m. Ascertain if A and B are intervisible and if necessary find how much B should be raised, so that the line of sight must nowhere be less than 3 m above the ground. *10*

(d) Describe the working of pneumatic tyred roller and tamping roller. Also indicate the areas of application. *10*

Q4. (a) (i) State the important properties of concrete which govern the design of concrete mix. Explain them in brief. *5*

(ii) Discuss various systems of ventilation with neat sketches. *5*

(b) A closed traverse was conducted round an obstacle and the following observations were made. Work out the missing quantities. *10*

Side	Length (m)	Bearing
AB	510	99° 30′
BC	615	35° 20′
CD	470	290° 30′
DE	–	232° 00′
EA	–	153° 10′

(c) Draw a neat sketch of a typical layout of a railway level crossing, indicating the various components. Discuss critical aspects of the layout. *10*

(d) (i) One kilometre straight length AB of a highway changes elevation from 200 m to 250 m above mean sea level. On a vertical photograph taken with a camera having focal length of 20 cm, the portion of the road measured is 8 cm. Calculate the flying height above mean sea level. *5*

(ii) Calculate the safe stopping sight distance for design speed of 60 kmph for two way traffic on a single lane road. Assume coefficient of friction as 0·35 and reaction time of driver as 2·5 sec. *5*

SECTION B

Q5. (a) Compute the basewidth of elementary profile of a gravity dam based on stress criteria. Also decide whether the dam is a high gravity dam or not. The height of the dam is 80 m. Unit weight of water is 1 ton/m^3. Free board is zero. Uplift pressure coefficient is zero. Specific gravity of the dam material is 2·5. Allowable compressive stress of dam material concrete is 250 ton/m^2. *8*

(b) Explain the various effects of water-logging. *8*

(c) Discuss the effects of horizontal and vertical accelerations of earthquakes on gravity dams in reservoir empty and full conditions. *8*

(d) What is an intake structure ? Enumerate various types of intakes. Explain the river intake with a neat diagram. *8*

(e) For water supply of a town, water is pumped from a reservoir 3 km away. The maximum difference of level between the river and the reservoir is 20 m. The population of the town is one lakh with a per capita demand of 150 *l*pd. If the pumps are to operate for 8 hours daily, and the efficiency of the pumps is 80%, calculate the BHP of the pumps. Assume friction factor as 0·0075, velocity in the pipe as 2 m/s and a maximum daily demand of 1·5 times the average demand. *8*

Q6. (a) The Horton's infiltration equation for a basin is given by $f = 6 + 16e^{-2t}$ where 'f' is in mm/hr and 't' is in hours. What are the values of f_0, f_c and k ? If a storm occurs on this basin with an intensity of more than 22 mm/hr, determine the depth of infiltration for the first 45 minutes and the average infiltration rate for the first 75 minutes ? *10*

(b) What is Environmental Impact Assessment (EIA) and why should we have EIA for any development project ? What are the important points considered for preparing the environmental impact statement ? *10*

(c) (i) Write the sources for radioactive wastes and their safe disposal. 5

(ii) Explain briefly the factors affecting consumptive use of water and double mass curve. 5

(d) (i) Explain break point chlorination with a neat diagram. 5

(ii) The quantity of chlorine used to treat 20,000 m^3 of water per day is 8 kg. The residual chlorine after contact period of 10 min is found to be 0·2 mg/*l*. Calculate the chlorine dosage in mg/*l* and the chlorine demand of water. 5

Q7. (a) (i) What is construction pore pressure ? Explain how the upstream and downstream slopes fail due to it. 5

(ii) Explain the protection works at the downstream of spillways when the jump height curve (JHC) lies lower than tail water curve (TWC) at all discharges. 5

(b) The water level in an open well was depressed by 3·0 m by pumping and it recuperated 1·5 m in 60 minutes, while doing a recuperation test. Find the

(i) yield from a well of 3·5 m diameter under a depression head of 2·8 m, and

(ii) diameter of the well to yield 8 lt/sec under a depression head of 2 m. 10

(c) Explain the following as short answers :

(i) Syphon Aquaduct 3

(ii) Attracting groynes 3

(iii) Canal escape 2

(iv) Cylinder fall 2

(d) (i) Describe the working of oxidation pond with a neat diagram. Write its advantages and disadvantages. 5

(ii) Briefly explain the Environment (Protection) Act, 1986. 5

Q8. (a) The peak of a flood hydrograph due to a 6-hour storm is 470 m^3/sec. The mean depth of rainfall is 8 cm. Assume an average infiltration loss of 0·25 cm/hr and a constant base flow of 15 m^3/sec. Estimate peak discharge of a 6-hour unit hydrograph for this storm. *10*

(b) Explain the procedure for preparing a layout for a sewerage system and list out the different types of sewers in the order of their occurrence. *10*

(c) (i) Write causes and effects of hardness and its removal by lime-soda process. *5*

(ii) Explain duty and delta and their relation in brief. *5*

(d) If the field capacity of the soil is 25%, permanent wilting point is 11%, density of soil is 1·4 g/cm^3, effective depth of root-zone is 72 cm and daily consumptive use of water for the given crop is 12 mm, find the watering frequency to ensure efficient irrigation to the given crop. Readily available moisture is same as available moisture. *10*