[This question paper contains 4 printed pages]

Roll No.	

ASME-23B-CENG-II

CIVIL ENGINEERING (PAPER-II)

Time Allowed: 3 Hours [Maximum Marks: 100

QUESTION PAPER SPECIFIC INSTRUCTIONS

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

1. There are EIGHT questions printed in English.
2. Candidate has to attempt **FIVE** questions in all.
3. Question No. 1 is compulsory. Out of remaining seven questions, **FOUR** are to be attempted.
4. All questions carry equal marks. The number of marks carried by a question/ part are indicated against it.
5. Write answers in legible handwriting. Each part of the question must be answered in sequence and in the same continuation.
6. Wherever assumptions are made for answering a question, they must be clearly indicated prior to their use.
7. Diagrams/ Figures, wherever required, shall be drawn neatly. All standard notations carry usual meaning. Any missing data can be suitably assumed.
8. Attempts of the questions shall be counted in sequential 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 answer book must be clearly struck off.
9. Re-evaluation/ re-checking of answer book of the candidate is not allowed.

Q1. (a) From a common point A, traverses are conducted on either side of a harbor as follows:

Traverse (I)		
Line	**Length (m)**	**Bearing**
AB	200	85°26’20”
BC	100	125°10’40”
Traverse (II)		
AD	225	175°50’00”
DE	500	85°06’40”

Calculate the distance from C to a point F on DE due south of C and the distance EF.

(5)

(b) The velocity components of a flow are given by u = -x, v = 2y and w = 5-z, derive the equation of stream line passing through a point (2, 1, 1). (5)

(c) Enumerate factors to be considered in locating an intake structure and the main considerations in the design of an intake structure? (5)

(d) Draw a neat sketch of acute railway crossing and label its parts giving a brief description. (3+2)

Q2. (a) Write down the construction steps for Water Bound Macadam road. Also compare WBM with WMM construction. (6+4)

(b) A two-lane, two-way highway is designed for design speed of 80 km/hr. A vertical curve is to be provided at intersection of downward gradient of 1 in 50 with another downward gradient of 1 in 20. Calculate the length of the vertical curve fulfilling the requirement of stopping sight distance and overtaking sight distance. The coefficient of longitudinal friction and the acceleration may be taken as 0.35 and 3.6 km/hr/sec respectively. (10)

Q3. (a) Design a stable channel for carrying a discharge of 30 m^3/sec using Lacey’s method assuming a silt factor equal to 1.0 (10)

(b) Describe the following methods for estimation of evaporation:

i. Evaporation- Pan Method

ii. Analytical Method (5+5)

Q4. (a) Reciprocal leveling between two points A and B, 630.5 m apart, on opposite sides of a river gave the following results:

Instrument	Height of Instrument	Staff at	Staff reading
A	1.360 m	B	1.585 m
B	1.335 m	A	0.890 m

Determine the difference in levels between A and B, and the amount collimation error in the instrument. (10)

(b) The measured photo coordinates of images a and b of two ground points A and B are x_a= +45.35 mm; y_a= +38.41 mm, x_b = -40.16 mm; y_b = -45.65 mm. Determine the ground coordinates of A and B and hence compute the horizontal length of the line AB. The elevations of points A and B are respectively 200 m and 150 m above the datum and the flying height is 1500 m above the datum. Take f = 152.4 mm. (10)

Q5. (a) Water emerges from a spillway with a velocity of 20 m/s and a depth of 0.5 m at the toe which is the min depth estimate one distance of hydraulic jump from the spillway toe. If no specific measures are taken for the formation of jump at the toe. Assume the d/s channel as having n = 0.20 and S_0 = 0.001 calculations may be performed by direct step method taking only one step assume channel to be wide rectangular. (10)

(b) A trapezoidal channel of base width 6 m and the slope of 2H: 1V carries a flow of 60 cumecs at a depth of 2.5 m. There is a smooth transition to a rectangular section 6 m wide.

i. Determine the depth of flow in a rectangular section and the change in the water surface level if the transition is accompanied by a gradual lowering of channel bed by 0.6 m.

ii. Determine the amount by which the bed should be lowered if the depth in water surface is restricted to 0.3 m. Assume no losses.

(5+5)

Q6. (a) Water flowing through a 20 cm diameter pipe with friction factor f = 0.04. The shear stress at a point 4 cm from the pipe axis is 100 N/m^2. Calculate the shear stress at the wall of the pipe. (10)

(b) The length of a submarine is 80 m and its surface area is 3000 m^2. If the submarine is moving with a velocity of 4 m/s, determine the frictional drag, considering

i. The boundary layer to be turbulent over the entire surface
ii. The surface of the submarine is rough with roughness height 3 mm.

[$\mu = 1.0 \times 10^{-3}$ Pascal-sec and $\rho = 1040$ kg/m^3] (5+5)

Q7. (a) Population of a town is 20,000 with an assured water supply of 150 liters per head per day. BOD of the waste water is 150 mg/l. Design the most suitable waste water treatment system (without power supply) for town and also design inlet and outlet pipe. (10)

(b) Flow = 50000 m^3/d. Raw wastewater BOD_5 = 250 mg/l. SS = 400 mg/l, efficiency of PST = 35% and 75 % w.r.t BOD and SS respectively, k_d = 0.06 /day. Primary and Secondary excess sludge concentration = 40 and 10 kg/m^3, respectively. Aeration equipment transfer efficiency = 1.8 kg oxygen per kW-hr. The sludge age can be adopted as 6.5 days. Determine aeration tank volume, excess sludge wasted both in weight and volume, total sludge generated. (10)

Q8. (a) A water treatment plant is to treat water at the rate of 6000 m^3/day. If there are two rectangular sedimentation tanks (27 m × 5 m × 3.8 m) with total weir length of 50 m, determine the followings:

(i) Detention time
(ii) Overflow rate
(iii) Weir loading. (4+3+3)

(b) After how many days will you order irrigation in order to ensure healthy growth of crops, if

i. Field capacity of soil =29%
ii. Permanent wilting percentage =11%
iii. Density of soil = 1300 kg/m^3
iv. Effective depth of root zone = 700 mm
v. Daily consumptive use of water for the crop = 12 mm

For healthy growth moisture content must not fall below 25% of the water holding capacity between the field capacity and the permanent wilting point. (10)

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