[This question paper contains 4 printed pages]

Roll No.	

25BC-ECM-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. Question No. 1 is compulsory. Out of remaining seven questions, attempt any ***four*** questions..
3. All questions carry equal marks. The number of marks carried by a question/ part are indicated against it.
4. Write answers in legible handwriting. Each part of the question must be answered in sequence and in the same continuation.
5. Wherever assumptions are made for answering a question, they must be clearly indicated prior to their use.
6. Diagrams/ Figures, wherever required, shall be drawn neatly. All standard notations carry usual meaning. Any missing data can be suitably assumed.
7. 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.
8. Re-evaluation/ re-checking of answer book of the candidate is not allowed.

1. a) A stream has a width of 25 m and depth of flow 2.5 m. Mean velocity of flow is 1.10 m/s. Find the height of a weir to be built in the stream to raise the water level by 1.2 m. Assume coefficient of discharge as 0.90.

b) Discuss the various causes of disintegration and major faults occurring in WBM and surface treated (asphalt roads) in India.

c) A bed uniform sand, having particle size 0.65 mm diameter and specific gravity 2.66, porosity 0.48 and depth 75 cm is to be washed hydraulically. Compute backwash rate so that expansion will be 50 percent. Also calculate head loss at this rate. Take kinematic viscosity of water as 1.3×10^{-2} cm^2/s and assume $C_D = 24/R$.

d) An area of 10 km x 20 km is to be surveyed using aerial photography. Average scale of photographs is 1: 10000 at ground elevation of 400 m from datum. Focal length of camera is 20 cm and size of photographs are 23 x 23 cm. Speed of aircraft is 270 kmph. The forward lap in photographs is 70% and side lap is 30%. Determine the flying height, exposure interval and number of photographs required to compute the survey.

4x5 = 20

2. a) Amount of water flowing from certain catchment area at proposed dam site are as tabulated below:

Month	January	February	March	April	May	June
Inflow ($\times 10^5$) m^3	2.83	4.25	5.66	18.40	22.64	22.64
Month	July	August	September	October	November	December
Inflow ($\times 10^5$) m^3	19.81	8.49	7.10	7.10	5.66	5.66

Determine the minimum capacity of a reservoir if water is to feed the turbines of hydropower plant at a uniform rate and no water is to be spilled over.

b) Describe field method of finding CBR value of a subgrade. Also explain the method of design of a flexible method using the soaked CBR value.

10+10=20

2. a) The ordinates of 6 hr UH of catchment are:

Time (hr)	0	6	12	18	24	30	36	42
Discharge(cumecs)	0	10	40	55	45	30	7	0

The unit depth of unit hydrograph is 1 cm. Arrive at Direct runoff hydrograph resulting from the following excess rainfall hyetograph occurring over the catchment.

Duration (hr)	Rainfall Intensity (cm/hr)
0 - 6	1
6 – 12	0.5

b) Design a lined canal to carry 100 cumecs discharge on a slope of 1 in 2500. Maximum permissible velocity is 2 m/s. Manning's constant n = 0.013 and side slope is 1.25 H : 1.0 V.

c) A rectangular sewer with width twice its depth is hydraulically equivalent to a circular sewer. Find the relation between the width of the rectangular sewer and diameter of the circular sewer assuming that sewer is running completely full.

7+7+6 =20

4. a) With the help of neat sketch, explain the reactions that happen at different stages of the breakpoint chlorination curve. Also, state the importance of breakpoint chlorination in water treatment.

b) Two pipes have been connected to a large water reservoir. One of them is 15 cm diameter of length 300 m with an outlet 4 m below the reservoir water level. While the other pipe is of diameter 20 cm and length 600 m. Both the pipes have free discharge at outlet end and total discharge rate is 50 l/s. Calculate the difference of elevation between the reservoir water level and the outlet of 20 cm dia pipe. Neglect entrance losses and for all pipes f = 0.08 in Darcy's formula.

10+10=20

5. a) An expressway of 4 lane divided passing through a flat terrain has a horizontal curve of radius equal to ruling minimum radius. If design speed is 120 kmph, calculate the following elements of curve:

i. Ruling minimum radius
ii. Super elevation
iii. Extra widening
iv. Length of transition curve

b) The BOD rate constant (k) for a river's BOD assimilation was determined to be 2.0/day (base e). The BOD of this river after leaving a heavily populated town was determined to be 50 mg/l. Determine the distance after which the river's BOD would become 4 mg/l when the average velocity of the river was 1 m/sec. What would have been the k value if this distance would have been 300 km and state what k demonstrates?

10+10=20

6. a) In a hydraulic jump occurring in a horizontal channel, Froude's number before the jump is 10.0 and energy loss is 3.2 m. Estimate the sequent depths, discharge intensity and Froude's number after the jump.

b) Calculate the included angles after correction for local attractions.

Line	PQ	QR	RS	ST	TP
Fore bearing	N62˚45'E	N21˚00'W	N71˚30'W	S39˚00'W	S54˚30'E
Back Bearing	S62˚15'W	S20˚45'E	S71˚30'E	N38˚00'E	N53˚15'W

c) Flood frequency computations are as:

Return Period (T years)	50	100
Peak flood (m^3/sec)	20,500	25,400

Estimate the flood magnitude with a return period of 150 years through use of Gumbel's method.

7+6+7 =20

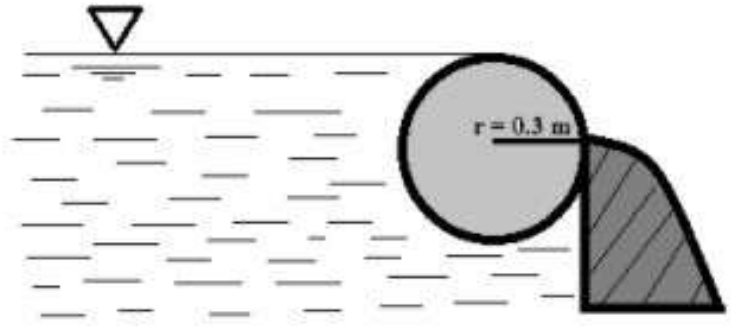
7. a) The circular base of a cylindrical tank is of 1 m diameter and has an orifice of 10 cm diameter. The discharge coefficient C_d for orifice is 0.6. Initially the tank is empty and then it is filled from the top using a pipe discharging 0.025 cumecs. How long will it take to fill the tank up to a height of 1 m? What will be the maximum height to which the tank can be filled?

b) Speed density relationship for a particular road was found to be: u = 42.76 – 0.22k , where u is speed in km/h and k is density in veh/km. Find the capacity of road and give comments on the result. Also sketch the relationship between density and flow and indicate the important traffic flow parameters on it.

10+10=20

8. a) An irrigation canal takes off from a perennial river. Explain and sketch a typical layout of diversion headworks. Indicate therein the various components of the headworks.

b) A cylinder of radius 0.3 m is located in water as shown. The cylinder and the wall are smooth. For a 1.5 m length (inside) of cylinder, find its weight. Also find the resultant force exerted by the wall on cylinder.



10+10=20