

HAS (main) - 2021

This question paper contains 5 printed pages]

**ASME-21-CENGG-(II)**  
**CIVIL ENGINEERING (PAPER-II)**

Roll Number

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 total **EIGHT** questions printed in English.
2. Candidate has to attempt **FIVE** questions in all.
3. Question No. 1 is compulsory. Out of the 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. Unless otherwise mentioned, symbols and notations carry their usual standard meanings.
8. Use of I.S. Codes of practice and Steel Sections Handbook is permitted.
9. Attempts of 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.
10. Re-evaluation/Re-checking of answer book of the candidate is not allowed.

1. (a) Which are various factors affecting skid resistance ? 10
- (b) What are various functions of a transition curve ? How do you calculate the length of a transition curve ? 10

2. The following bearings were observed with a Compass for a closed traverse :

| Line | F.B.     | B.B.     |
|------|----------|----------|
| AB   | 16°-45'  | 198°-00' |
| BC   | 224°-30' | 47°-30'  |
| CD   | 207°-15' | 25°-45'  |
| DE   | 67°-45'  | 247°-30' |
| EA   | 155°-15' | 332°-45' |

- (a) Correct the bearing for local attraction, if any and also calculate angles. 8+4
- (b) If the declination is 2°-30' west, calculate the true bearings. 8
3. (a) What are various types of energy losses in pipes ? Explain them in detail. 10
- (b) Derive the condition for maximum transmission of power through pipes. 10
4. Derive the condition of most economical trapezoidal channel ? Also determine its hydraulic mean depth and its relationship with semicircle. 20

5. The following are the ordinates of the hydrograph of flow from a catchment area of  $770 \text{ km}^2$  due to a 6-h rainfall. Drive the ordinates for the 6-h unit hydrograph. Make suitable assumptions regarding the base flow : 20

| Time (h) | Flow ( $\text{m}^3/\text{s}$ ) |
|----------|--------------------------------|
| 0        | 40                             |
| 6        | 65                             |
| 12       | 215                            |
| 18       | 360                            |
| 24       | 400                            |
| 30       | 350                            |
| 36       | 270                            |
| 42       | 205                            |
| 48       | 145                            |
| 54       | 100                            |
| 60       | 70                             |
| 66       | 50                             |
| 72       | 42                             |

6. Water is pumped from a low level reservoir to a high level reservoir through a main pipeline of 0.45 m diameter and 1300 m length. The pump is located at the low level reservoir. At a point along the main line at a distance of 450 m from the high level reservoir, a branch line of 0.3 m diameter and 340 m length takes off to discharge 190 l/sec in the atmosphere.

Level of water surface in high level reservoir = +30.00 m

Level of water in the open end of the

0.3 m diameter branch line = +23.50 m

Level of water surface in low level reservoir = +15.00 m

Darcy's friction co-efficient for both pipes = 0.035

Determine the flow rate into the high level reservoir and the theoretical H.P. of the pump, assuming the delivery valve of the pump to be at + 20.00 m. 20

7. Design an unlined trapezoidal section for the outfall reach of an open urban storm water drain, draining a catchment area of 118 hectares. The following is additional given data :

(i) Inlet time = 28 minutes

(ii) Flow time in upper reaches of the drain = 32 minutes

(iii) Co-efficient of run-off for the area = 0.6

(iv) Design water surface slope = 1 in 3050

(v) The drain has to be designed for 5 years rain frequency, and is situated near a place for which depth duration curves are available.

(vi) Critical rainfall intensity for 5 years rain frequency may be taken as 6.5 cm/hr.

(vii) The drain is to be constructed in cutting with a maximum permissible flow velocity of 0.9 m/sec and in slope of 1H : 1V.

(viii) Manning's constant may be taken as 0.025. 20

8. (a) How is soil water divided in different categories ? 10

(b) During a particular stage of the growth of a crop, consumptive use of water is 2.3 mm/day. Determine the interval in days between irrigations and depth of water to be applied when the amount of water available in the soil is 20% of the maximum depth of available water in the root zone, which is 75 mm. Given, irrigation efficiency is 70%. 10

