महाराष्ट्र स्थापत्य अभियांत्रिकी सेवा मुख्य परीक्षा - 2024

दिनांक - 9 (मे, 2024.

2024 **F20**

BOOKLET NO.
700401

Civil Engineering
Paper – II

Time Allowed : Three Hours **Maximum Marks : 200**

Medium : English **Type of Paper : Conventional**

Question Paper Specific Instructions

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

1. There are **EIGHT** questions divided in two Sections, out of which **FIVE** are to be attempted.
2. Questions no. 1 and 5 are compulsory. Out of the remaining questions, THREE are to be attempted choosing at least ONE question from each Sections.
3. The number of marks carried by a question/sub question is indicated against it.
4. Keep in mind the word limit indicated in the question if any.
5. Wherever option has been given, only the required number of responses in the serial order attempted shall be assessed. Unless struck off, attempt of a question shall be counted even if attempted partly. Excess responses shall not be assessed and shall be ignored.
6. Candidates are expected to answer all the sub-questions of a question together. If sub-question of a question is attempted elsewhere (after leaving a few page or after attempting another question) the later sub-question shall be overlooked.
7. Any page or portion of the page left blank in the Answer Booklet must be clearly struck off.
8. Unless otherwise mentioned, symbol and notation have their usual standard meanings. Assume suitable data, if necessary and indicate the same clearly.
9. Neat sketches may be drawn, wherever required.
10. The medium of answer should be mentioned on the answer book as claimed in the application and printed on admission card. The answers written in medium other than the authorized medium will not be assessed and no marks will be assigned to them.

Note – 1. Candidates will be allowed to use Scientific (Non-programmable type) calculators.

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P.T.O.

SECTION – A

Q1. Write short notes on **any five** of the following : **(8×5=40)**

(a) Theodolite surveying, types and principles of theodolite and uses of theodolite surveying.

(b) Properties of fresh and hardened concrete.

(c) Key aspects of building planning and construction for water supply sanitation.

(d) Basic properties of fluids, descriptions and its importance.

(e) Hydraulic turbines, types and criteria of selection.

(f) Earth dams and gravity dams with its failure criteria.

(g) Linear and angular curve settings in surveying.

Q2. (a) Explain in detail : the working of prismatic compass, its components with neat sketch and key terms used in prismatic compass surveying with its functions. **(5×3=15)**

(b) Discuss and explain in detail. **(5×3=15)**

i) Concrete mix design.

ii) Bitumen, its sources and engineering applications.

iii) Design and types of formwork.

(c) Explain the following : **(2.5×4=10)**

i) Principle of Tachometric Surveying.

ii) Photogrammetry surveying, uses and its types.

iii) Hydrographic surveying and its uses.

iv) Total stages and its applications.

Q3. (a) Explain with neat sketches. **(5×3=15)**

i) Floor Space Index (FSI) and building byelaws.

ii) Thermal ventilation in buildings and factors influencing thermal ventilation effectiveness.

iii) Fire protection system in building and fire safety precautions.

(b) Discuss in detail with neat sketches. **(5×3=15)**

i) Hydraulic jump in open channel flow.

ii) Water Hammer Theory in pipe flow.

iii) A horizontal venturi meter with inlet diameter 200 mm and throat diameter 100 mm is used to measure the flow of water. The pressure at inlet is 17.66 N/cm^2 and the vacuum pressure of throat is 300 mm of mercury. Find the discharge of water through venturimeter. Take Cd = 0.98.

(c) Explain the following : **(2.5×4=10)**

i) Duty, Delta, base period and their relationship.

ii) Canal irrigation system and distribution network.

iii) Cross drainage work.

iv) Lake Tapping.

Q4. (a) Explain in detail. **(5×3=15)**

i) Hydroelectric power plants, constituents, schematic arrangements and its working.

ii) Working principle, types of heads and types of centrifugal pumps.

iii) Working principle, main components, capacity and slip of a reciprocating pump.

(b) Explain in detail. **(5×3=15)**

i) Field capacity and frequency of irrigation with neat sketch.

ii) Meandering river and types of groynes with neat sketch.

iii) Tail Water Curve (TWC), Jump Height Curve (JHC) and energy dissipating devices.

(c) Explain the following : **(2.5×4=10)**

i) Vertical Transportation System in Building.

ii) Finishing work in building construction.

iii) Water proofing.

iv) Types of roofs.

SECTION – B

Q5. Write short notes on **any five** of the following : **(8×5=40)**

(a) Factors controlling highway alignment.
(b) Types of TBM.
(c) Types of Cost.
(d) Flood routing and its types.
(e) Water quality parameters.
(f) Solid waste management.
(g) Sources and effects of Air Pollution.

Q6. (a) Explain in detail relative merits and demerits of tunnels and open cuts for the following projects. **(5×3=15)**

i) Road traffic
ii) Rail traffic
iii) Water transfer.

(b) Explain in detail. **(5×3=15)**

i) Precipitation.
ii) Safety measures of accident related to engineering.
iii) Difference between rigid and flexible pavements.

(c) What are the three types of hydrograph and which factors affect them ? **10**

Q7. (a) What are the five levels of cost estimation ? **8**

(b) Which factors affect Runoff ? **7**

(c) Explain in detail necessity of providing curves to roads. **8**

(d) Describe the problems of tunneling through hard strata and soft strata. **7**

(e) What are waste water characterization and what methods are used to treat the sewage water ? **10**

Q8. (a) Explain in detail.

i) Types of Tunnel, their usefulness and need.
ii) Factors affecting arbitration costs. **(7.5×2=15)**

(b) Explain in detail.

i) Methods of valuation.
ii) Ground water.
iii) Noise Pollution. **(5×3=15)**

(c) Explain in short "white topping" and its three methods. **10**

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