[This question paper contains 4 printed pages]

Roll No.	

ASME-23B-CENG-I

CIVIL ENGINEERING (PAPER-I)

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) An embankment for a highway is to be constructed from a soil compacted to a dry unit weight of 18 kN/m^3. The soil has to be trucked to the site from a borrow pit. The bulk unit weight of soil in the borrow pit is 17 kN/m^3 and its natural water content is 50%. Calculate the volume of the soil from the borrow pit required for one cubic meter of embankment. (G =2.7) (5)

(b) Explain five important factors which should be considered for selection of equipment for a construction project. (5)

(c) What are the impurities in lime and how do they affect the cementing properties? (5)

(d) What are three basic qualities of high performance concrete? Discuss the contradiction with conventional concrete. (3+2)

Q2. (a) A retaining wall 6 m high with smooth vertical back supports a cohesive backfill having unit weight 18 kN/m^3, apparent cohesion 26 kN/m^2 and angle of internal friction zero. Derive the formula for active earth pressure and calculate (2+2+2+2+2+2)

a) Active pressure intensity at the top of the wall

b) Depth of tension crack

c) Active pressure intensity at the base

d) Resultant earth pressure considering soil cannot take tension

(b) In a laboratory consolidation Test, a 2.5 cm, thick sample of clay reached 60% consolidation in 17 minutes under double drainage condition. Determine the time required for 60% consolidation of a layer of this soil in the field under the following conditions.

i. When a 3 m thick layer of the given soil is sand witched between two sand layers.

ii. When a 5 m thick layer of the soil is overlain by a sand layer and underlain by a deep layer of intact shale. (5+5)

Q3. (a) A pumping out test was carried out in the field, in order to determine the average coefficient of permeability of an 18 m thick sand layer. The ground water table is located at a depth of 2.2 m below the ground level. A steady state was reached when the discharge from the well was 21.5 lit/sec. At this stage, the drawdown in the test well was 2.54 m, while the drawdowns in two observations well situated at 8 m and 20 m from the test well were found to be 1.76 m and 1.27 m respectively. Determine.

i. Co-efficient of permeability of the sand layer in m/day
ii. Radius of influence of test well
iii. Effective size of the sand (6+2+2)

(b) Draw a neat sketch of complete operational sequence of wet process in making cement. Also compare with Dry process. (8+2)

Q4. (a) A bar 40 mm in diameter is subjected to a tensile force of 40000 kg. The extension of bar measured over a gauge length of 200 mm was 0.318 mm. The decrease in diameter was found to be 0.02 mm. Calculate the values of

(i)Young's modulus of elasticity

(ii) Modulus of rigidity of the material. (10)

(b) The principal stresses at a point in an elastic material are 1.5 σ (tensile), σ (tensile) and 0.5 σ (compressive). The elastic limit in tension is 210 MPa and Posisson's ratio μ= 0.3. What would be the value of σ at failure when computed by different theories of failure? (10)

Q5. (a) A uniformly distributed load of 40 kN/m and 5 m long crosses a simply supported beam of span 15 from left to right. Draw the influence line diagram for shear force and bending moment at a section 6 m from left end. Use these diagrams to get the maximum shear force and bending moment at this section. (10)

(b) A construction work consists of activities with PERT durations in days as given below:

Activity	P	Q	R	S	T	U	W	Y	Z
Predecessors	-	P, T	Q	-	S	-	S	S	U, W
t_o (in days)	3	4	4	3	8	1	2	4	6
t_m (in days)	6	8	5	3	11	4	5	7	15
t_p (in days)	9	9	9	3	17	7	14	13	30

Determine:

i. The probability of completing the job in 32 days and

ii. The completion time with 50% probability

Z	-1.5	-1.3	-1.0
Probability	0.07	0.10	0.16

(5+5)

Q6. (a) Determine the centroid and shape factor of an I section which is symmetrical about vertical axis, top flange being 5 cm x 5 cm, bottom flange 20 cm x 2 cm and web 2 cm x10 cm.

(10)

(b) Design a single angle strut connected to the gusset plate to carry 180 kN factored load. The length of the strut between center to center intersection is 3 m. (10)

Q7. (a) Determine moment of resistance of a R.C. beam having a rectangular cross-section 300 mm wide and 500 mm deep reinforced with 5 nos. 20 mm radius tensile reinforcement. The characteristic strength of concrete is 15 MPa and that for steel is 250 MPa. (Assume clear cover=25 mm).

(10)

(b) Design an axially loaded column tied column 400 mm x 400 mm pinned at both the ends with an unsupported length of 3 m for carrying a factored load of 2300 kN. Use M 20 concrete and Fe 415 steel. (10)

Q8. (a) A Raft foundation is supported by pile group consisting of 15 piles arranged in 3 rows. The diameter and length of each pile are 300 mm and 15 m respectively. The spacing between the piles is 1.2 m. The foundation soil consists of a soft clay layer having c = 3.2 t/m^2 and γ = 1.9 t/m^3. Determine the capacity of the pile group. (10)

(b) A prestressed concrete beam of rectangular section 300 mm wide and 600 mm deep has a span of 12m. The effective prestressing force is 980 kN at an eccentricity of 130 mm. The dead load of the beam is 4.5 kN/m and the beam has to carry a live load of 7.5 kN/m. Determine the extreme stresses:

(i) at the end section

(ii) at the mid-section without the action of live load.

(iii) at the mid-section with the action of live load.

(4+3+3)

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