Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH(CE)/SEM-8/CE-802/2/2012

2012
BRIDGE ENGINEERING

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

GROUP – A
(Multiple Choice Type Questions)

1. Choose the correct answers for the following : $10 \times 1 = 10$

i) Co-efficient of thermal expansion per degree Centrigrade for steel bridge is

a) $11{\cdot}7 \times 10^{-6}$ b) $10{\cdot}8 \times 10^{-6}$

c) $11{\cdot}0 \times 10^{-5}$ d) $10{\cdot}0 \times 10^{-5}$.

ii) If the span of an R.C.C. bridge is 9·0 m, the impact factor for class (IRC) *A* or *B* loading is

a) 0·45 b) 0·3

c) 0·75 d) none of these.

iii) The horizontal seismic force on a bridge structure is computed from the equation

a) $F_{eq} = L_a (G + A_h)$ b) $F_{eq} = G (A_h + L_a)$

c) $F_{eq} = A_h (G + L_a)$ d) $F_{eq} = G \times A_h \times L_a$.

iv) If the catchment area is 160 km^2 and distance of site from coast is 12 km, maximum flood discharge according to Ryve is

a) 216 m^3/s b) 225 m^3/s

c) 201 m^3/s d) 270 m^3/s.

v) The maximum depth of scour *D* below the HFL for a severe bend is

a) 2·00 dsm b) 1.75 dsm

c) 1·27 dsm d) 1·5 dsm.

vi) For beam, using grade of steel Fe_{415}, the minimum tension reinforcement is

a) 0·25% of bd b) 0·2% of bd

c) 0·12% of bd d) 0·15% of bd.

vii) Modulus of elasticity of concrete grade M 40 is

a) $0{\cdot}40 \times 10^5$ b) $0{\cdot}316 \times 10^5$

c) $0{\cdot}35 \times 10^5$ d) $0{\cdot}45 \times 10^6$.

viii) For economic reasons, the width of the median may be kept low, but should not be less than

a) 1·5 m b) 1·30 mm

c) 1·2 m d) 1·0 m.

ix) The clear distance of wheel from the wheel guard for IRC class *AA* wheel vehicle of carriageway width over 5.3 m is

a) 0·30 m minimum b) 1·2 m minimum

c) 1·20 m maximum d) 0·30 m maximum.

x) Nose to tail length of IRC tracked vehicle is

a) 3·6 m b) 4·0 m

c) 5·6 m d) 7·2 m.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. Describe the advantage and disadvantage of stone masonry bridges.

3. Discuss how a bridge may be an aesthetic statement reflecting the quality of life in the community.

4. How would you determine the effective flange width of a T-beam and of an L-beam ?

5. Discuss the principle and area of application of (i) Full Prestress (ii) Limited Prestress (iii) Partial Prestress.

6. How is afflux caused and how is its value estimated ? How does the magnitude of afflux influence the design of a bridge ?

7. What is meant by economical span ? Derive the condition of an economical span stating clearly the assumptions.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

8. Design a deck slab bridge for the following data :

Clear distance between abutment	=	6·70 m
Footpath	=	1·0 m on either side
Wearing coat (average)	=	80 mm
Loading	=	IRC class *AA* tracked vehicle

Road	=	National Highway (2-lanes)
Materials	=	Grade of concrete M 20 and grade of steel Fe 415

9. Design the cantilever portion of a girder bridge for the following data :

Clear width of road	=	6·8 m
Span C/C of bearing	=	16·0 m
Loading	=	IRC class *A* and class *AA* vehicle
Wearing coat	=	100 mm (average)
Material	=	Grade of concrete M 25 and grade of steel Fe 415.

10. Discuss in brief, losses in prestress due to Elastic shortening, Creep of concrete, Shrinkage of concrete, Relaxation of steel, Seating of anchorages, Frictional losses.

11. What are the factors to be considered in the determination of linear waterway and span length ?

12. For class A double lane Roadway Steel Truss Bridge as shown in the figure,

Roadway = 7.5 m
C/C of Truss = 10.5 m

Find out the vehicular live load in members *AB* and *CD*.