Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech(CE-NEW)/SEM-6/CE-604A/2013

2013
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 alternatives for any *ten* of the following : $10 \times 1 = 10$

i) Maximum axle load of IRC class *A* load is

a) 114 kN b) 68 kN

c) 41kN d) 27kN.

ii) The junction of cantilever and simply supported span of balanced cantilever bridge is referred to as

a) articulation b) pylon

c) superstructure d) shear connector.

iii) Main function of shear connector in composite bridge is

a) to prevent the separation of steel girder and in situ concrete slab

b) to take the shear stress generated due to live load

c) to increase the shear capacity of he bridge deck

d) to increase shear capacity of the longitudinal girder.

iv) Nose to tail length of IRC tracked vehicle is

a) 4 m b) 3·6 m

c) 5 ·6 m d) 7·2 m.

v) If the catchments area is 700 sq.km situated in Western India, maximum flood discharge according to Dicken's formula is

a) 1496·98 m^3/s b) 2993·96 m^3/s

c) 2585·69m^3/s d) 1905·25 m^3/s.

vi) The maximum scour depth from HFL for a moderate bend is

a) 1·27 dm b) 2 dm

c) 1·75 dm d) 1·5 dm.

vii) The clear distance of wheel from wheel guard for IRC class *AA* tracked vehicle of carriageway width 5·5 m and above is

a) 1·2 m maximum b) 1·2m minimum

c) 0·6 m minimum d) 0·15 m minimum.

viii) Total load of IRC class *AA* tracked vehicle is

a) 400 kN b) 350 kN

c) 700 kN d) 1000 kN.

ix) Two may bridge deck slab is designed by using

a) Piegaud's method b) Courbon's method

c) Rankine's method d) Massonate method.

x) Longitudinal loads due to braking of vehicles on a bridge is assumed to be

a) 20% of one train on bridge + 10 % of other or part thereof

b) 15% of 1st + 10% of 2nd train

c) 30% of 1st train only

d) 25% of all.

xi) Longitudinal load due to breaking of a vertical is assume to act at height of above the top of carriageway

a) 1·0 m b) 1·5 m

c) 0·7 m d) 1·2 m.

xii) 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.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. Discuss the importance of hydraulic factors in bridge design

3. State the different methods used in calculation of live load for analyzing of longitudinal girders of bridge deck system. What are the conditions to be satisfied in using Courbon's method.

4. Describe the sketches the different types of shear connectors used in composite bridge decks.

5. Discuss the general features of cable stayed bridge.

6. What are composite bridge and how to ensure the composite performance ?

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. Design a simply supported RCC deck slab bridge to suit the following data :

Width of carriageway = 7·5 m

Clear span = 6·5 m

Width of the kerb = 600mm

Width of the bearing = 400 mm

Thickness of wearing course = 80 mm

Type of loading IRC class AA tracked vehicle

Materials M30 grade concrete and Fe 415 grade HYSD bars

Design the deck slab only for flexure.

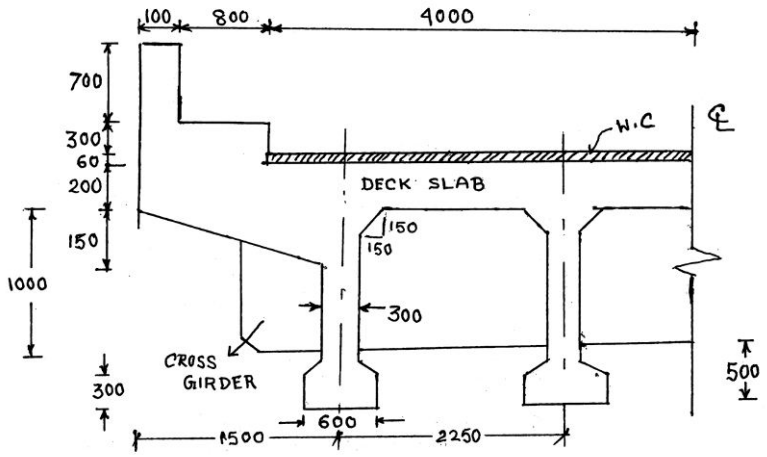
8. ... Design deck type welded plate girder bridge for a broad gauge railway line across a stream from the following data :

Span of bridge	= 30 m
D.L. intensity	= 13·5 kN/m
Live load for B.M. per track	= 2500 kN
Live load for S.F. per track	= 2705 kN
Critical stress feb	= 1500 N/mm^2,
	6bc = 158 N/mm^2

Design only for plate girder, connection between flange and web.

9. Calculate the live load moment for a two lane bridge for the internal longitudal girder, for IRC class A loading. The effective span of the bridge is 20 m. The detail of the RCC girder bridges are shown in fig. 1 :

No. of longitudal girder	= 4
No. of cross girder	= 5
Size of bottom flange of longitudal girder	= 600 × 300 mm
Thickness of web of longitudal girder	= 300 mm
Thickness of cross girder	= 200 mm
Size of fillets	= 150 × 150 mm
Centre to centre distance of longitudal grider	= 2250 mm
Size of cantilever slab (thickness)	= 150 mm to 350 mm



10. Obtain value of bending moment along short span and long span in case of interion panel of a *T* beam bridge having following data.

Dimension of panel 3·0 × 3·5 m loading IRC class A Loading pattern : one load of 57 kN on centre of panel and other load 57 kN eccentric :

Pigeauds Values :

K	U/B	V/L	ml	m2
0·85	0·22	0·117	0·198	0·168
0·85	0·22	0·8	0·12	0·078
0·85	0·22	0·56	0·13	0·096

11. A box culvert has the following specification :

Inside dimension = 3·5 m × 3·5 m

Width of carriageway = 5·5 m

Superimposed dead load = 15 kN/m^2

Live load = 51 kN/m^2

Unit of soil - 18 kN/m^3

Angle of repose of soil = 30°

Thickness of slab = 350 mm and thickness of wall = 350 mm

Calculate the joint moments of the culvert for the following load condition.

Box culvert subject to superimposed dead load, self weight, lateral pressure due to superimposed dead load and soil pressure.