

**G 6509**

M.E. DEGREE EXAMINATION, MAY/JUNE 2007.

*Elective*

Structural Engineering

ST 1624 — DESIGN OF BRIDGES

(Regulation 2005)

Time : Three hours

Maximum : 100 marks

Use relevant IRC Codes and Pigeaud's Curves are permitted

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is economic span length?
2. Mention the types of concrete arch bridges
3. What is impact effect for IRC Class A loading bridges?
4. What is effective width of a single concentrated load?
5. What is Pigeaud's theory?
6. What is the ratio of intermediate span to end span for economical design in continuous bridges?
7. Mention the methods of prestressing.
8. Mention the design loads for abutments.
9. Sketch a bearing stiffener used in plate girder.
10. List the types of bearing used in bridges.

PART B — (5 × 16 = 80 marks)

11. (a) Design a slab bridge for the following data:

Clear span : 6 m

Clear width of road way : 6.8 m

Live load : Class A loading

Concrete : M25

Steel : Fe 415

Average thick of wearing coat : 80 mm

Or

- (b) Explain with neat sketches Pigeaud's theory for multiple eccentric loads in a two way slab.

12. (a) Design a slab portion of a girder bridge for the following data:

Clear width of roadway : 6.8 m

Centre to centre of bearings : 16 m

Live load : Class A & Class AA

Average thickness of wearing coat : 80mm

Or

- (b) Explain Courbon's theory for distribution of live loads on longitudinal beam with a sketch.

13. (a) Give a detailed procedure of design of balanced cantilever bridges.

Or

- (b) Design a plate girder to carry a super imposed load of 100 kN per m on an effective span of 20m.

14. (a) Design a prestressed slab having span of 15m. It carries a load of 10 kN/ m<sup>2</sup>. Take losses at 15%. Allowable initial compressive stress is 17.5 N/mm<sup>2</sup>, final compressive stress is 14 N/mm<sup>2</sup> and tensile stress is 1 N/mm<sup>2</sup>.

Or

(b) Design a symmetrical prestressed beam having span of 15m and carrying superimposed load of 30 kN/m. The ultimate stress in steel is 1500 N/mm<sup>2</sup> for 7mm dia wires. The concrete used has cube strength of 35 N/mm<sup>2</sup> at 28 days on 15 cm cubes. Assume losses in prestress at 15%.

15. (a) Design a roller bearing for the road bridge to carry a total vertical load of 1200 kN.

Or

(b) Design a suitable masonry abutment for girder bridge having 6.8 m clear width of road way and length of 16m. The angle of internal friction of retained material is 30°. The angle of friction between soil and masonry is 20°. Effect of surcharge may be neglected. Height of abutment below road level is 5m. The passive earth pressure in front of abutment is to be neglected. Density of masonry: 20kN/m<sup>3</sup>. Density of concrete: 24 kN/m<sup>3</sup> and density of soil is 18 kN/m<sup>3</sup>.

le eccentric loads

data:

on longitudinal

r bridges.

00 kN per m on

carries a load of  
compressive stress is  
tensile stress is