G 1676 (Pages : 3) Reg. No.....

Name.....

# B.TECH. DEGREE EXAMINATION, MAY 2016

## Eighth Semester

Branch : Civil Engineering

CE 010 801—ADVANCED STRUCTURAL DESIGN (CE)

(New Scheme—2010 Admission onwards)

[Regular/Supplementary]

Time : Three Hours Maximum : 100 Marks



### Part A

*Answer* **all** *questions.*
*Each question carries* 3 *marks.*

1. What is the function of a box culvert ?
2. Classify shell structures.
3. List the different loads that act on a roof.
4. What do you mean by a girdes ?
5. Briefly explain steel bridges.

(5 × 3 = 15 marks)

### Part B

*Answer* **all** *questions.*
*Each question carries* 5 *marks.*

6. State the function of bearings.
7. Explain the structural action of folded plates.
8. What are the different types of bearings ?
9. Explain the design of a plate girder.
10. What is box culvert ?

(5 × 5 = 25 marks)

### Part C

*Answer* **all** *questions.*
*Each full question carries* 12 *marks.*

11. Design a box culvert having inside dimensions of 3 m. × 3 m. This culvert is subjected to a dead load of 14000 N/m.$^2$ and a line load of IRC class AA teacked vehicle. Assume the unit weight of soil to be 18,000 N/m.$^3$ The angle of repose of soil is 30°. Use M25 concrete and Fe415 steel. Road width is 7.5 m. span is 3.3 m.

*Or*

**Turn over**

12. Design a T-beam superstructure for a bridge on a NH. The following details are available :

Effective span : 18 m.

Live load : IRC class AA (tracked)

Materials : M40 concrete, Fe415 steel

Spacing of cross girders : 3 m.

Sketch the reinforcement details in the component parts of the deck.

13. A reinforced concrete circular shell has the following particulars :

Radius = R = 6 m., Span = 2L = 24 m., Semicentral angle = $\phi = 60°$, Thickness, $t$ = 50 mm. Calculate the maximum stress due to self weight only in the shell by beam theory and compare the values with the results of membrane theory.

*Or*

14. A reinforced concrete shell with a circular directrix has the following dimensions :

| | | |
|---|---|---|
| Distance b/w the teanesses | = | 30 m. |
| Radius of the shell | = | 8 m. |
| Thickness of shell | = | 60 mm. |
| Semi-central angle | = | 60°. |

If LL = 1 kN/m$^2$ of roof surface, calculate :



(a) Maximum compressive stress in the shell.

(b) Maximum bending moment and tension in the longitudinal edge of the shell.

15. The trusses for a factory building located at Gandinagar are spaced at 6 m. c/c and the purlins are spaced at 2 mc/c. The pitch of the truss is 28° and the span of the truss is 18 m. The roof consists of AC sheets with weight 16 kN/m$^2$. Design : (i) Suitable I section purlin ; and (ii) Angle section purlin.

*Or*

16. Design a prat $t$-type roof truss for an industrial building which is situated at Bhopal. Length is 40 m., width is 15 m., width of c/c of roof columns is 12 m., weight of column is 10 m., roofing material is AC cement sheets.

17. Design a welded plate grides of 30 m. span to support a LL of 75 kN/m. uniformly distributed over the span. Adopt permissible stresses as per TS. Draw the longitudinal elevation, cross-section and plan of the girder.

*Or*

18. Explain the design procedure of a gantry girder.

19. The effective span of a through plate girder two lane highway bridge is 30 m. The reinforced concrete slab is 250 mm. thick inclusive of the wearing coat. The foot paths are provided on both sides of the carriage way. The cross-girder are provided at 3 m. centres. The stringers are spaced at 2.45 m c/c. The spacing b/w main girders is 9.80 m. Design the maximum section of plate girder, if the bridge is to carry IRC class A standard loading.

*Or*

20. The effective span of a deck type plate girder two lane highway bridge is 30 m. The RC slab is 250 mm. thick inclusive of the wearing coat. Footh paths are provided an either side of carriageway. Design maximum section of plate girder, if the bridge is to carry IRC class A loading.

(5 × 12 = 60 marks)