



(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 100751

Roll No.

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B. Tech.

(SEM. VII) (ODD SEM.) THEORY
EXAMINATION, 2014-15
BRIDGE ENGINEERING

Time : 3 Hours] UPTUonline.com [Total Marks : 100

- Note :**
- (1) Attempt **all** the questions.
 - (2) All questions carry **equal** marks.
 - (3) Assume any missing data, suitably.

- 1 Attempt any **FOUR** parts of the following : **5×4=20**
- a) Which factors you will consider during the appropriate site selection for a bridge ? Discuss in detail.
 - b) Explain the various components of a bridge. Briefly discuss the economic span for bridges.
 - c) How many types of vehicle live loads are categorized based on their configuration and intensity ? Write about the IRC Class AA loading.
 - d) Explain the relative advantages and disadvantages of prestressed concrete bridges and RCC bridges.
 - e) What are the permissible stresses recommended by IRC followed while designing a bridge ?
 - f) Write the procedure for the design of a bridge by a method given by M. Pigeaud.

- 2 Attempt any **one** part of the following : **20×1=20**

- a) Design the culvert with the data :
Clear span of the culvert = 6.5 m
Clear carriage way width = 7.0 m
Size of kerb = 250mm × 500 mm
Average thickness of wearing coat 110 mm
Use M 25 concrete and Fe 500 steel.
Loading = IRC Class AA
Draw the cross section showing details of reinforcement at mid-span and at junction of the slab are kerb.
- b) Design a slab culvert for the following data :
Effective span = 5.0 m
Clear width of carriageway = 8.0 m
Thickness of wearing coat = 70 mm
Provide footpath of 800 mm wide on either side
loading = IRC Class AA
Use M 20 concrete and Fe 415 steel. Design and detail the slab bridge.

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- 3 Attempt any **one** part of the following : **20×1=20**

- a) Design a T-beam superstructure for a bridge on a national highway. The following details are available :
Effective span = 18m
Spacing of cross girders = 3m
No footpath on either
side loading class = IRC class AA (Tracked)
Use concrete of grade M 40 and steel of grade Fe 415.
Sketch the reinforcement details in the component parts of the deck.

- b) Design a box culvert having inside dimensions 3.5m×3.5m for the following data :
- Live load = IRC Class A
 - Density of soil = 18 kN/m³
 - Angle of repose = 30°
- Use M 25 concrete and Fe 415 steel.

4 Attempt any **one** part of the following : 20×1=20

- a) Using the following particulars to design a plate girder bridge for a broad gauge track :
- Span = 20 m
 - To level of the railway embankment = 115 m
 - Bed level of the stream = 100 m
 - Ground level suitable for foundation = 98 m
 - Stream bund top level = 101.50 m

- b) An open web girder bridge consists of two pratt trusses of the type shown in the Fig. 4.1. The span of the truss is 24 M c/c of bearings. The bridge supports an equivalent uniformly distributed live load of 200 kN per meter run. The dead load transmitted to each truss inclusive of self-weight is 17 kN/m. Design the members U₂L₃ and U₅L₄. Assume the impact factor to be 15%.

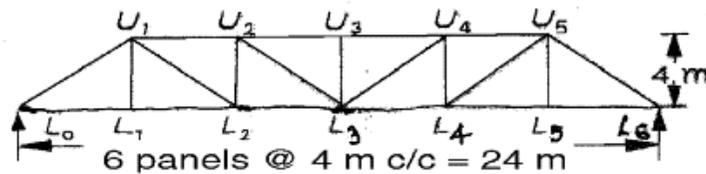


Fig. 4.1 UPTUonline.com

5 Attempt any **one** part of the following : 20×1=20

- a) Verify the stability of the abutment shown in Fig.5.1. The other salient details are given below :

- Material of the abutment = Concrete
- Live load on the bridge = IRC Class AA (Tracked)
- Density of soil = 18 kN/m³
- Angle of repose = 30°
- Coefficient of friction = 0.6

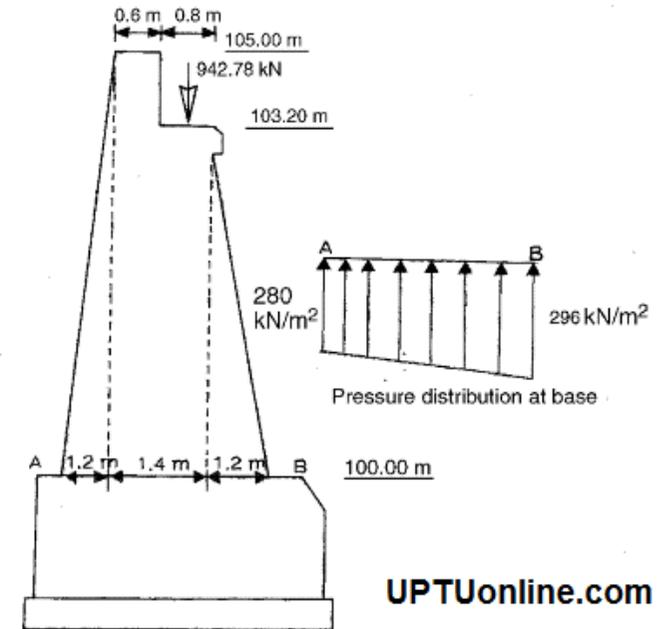


Fig. 5.1.

- b) A reaction of 2500 kN is expected at the supports of a 20 m spanned T-beam bridge. Design a rocker and roller bearing. The other details are :
- Allowable pressure on rollers = 5 N/mm diameter/mm length
 - Bearing pressure on rocker pin = 30 N/mm²
 - Allowable pressure on bearing plate = 2000 N/mm²
 - Allowable pressure on concrete bed block = 3.8 N/mm².