JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST -3 EXAMINATIONS-2022
M.Tech-II Semester (Civil/Structural)

COURSE CODE (CREDITS): 11M1WCE133   MAX. MARKS: 35
COURSE NAME: BRIDGE ENGINEERING
COURSE INSTRUCTORS: Mr. KAUSHAL KUMAR   MAX. TIME: 2 Hours

Note: All questions are compulsory. Marks are indicated against each question in square brackets. One Hand Written one sided cheat sheet is allowed.

Q1.   Explain the importance of Hydraulic design in Bridge Engineering.   [3 Marks]

Q2.   What are the various types of piers? What are the various forces considered in the design of piers?   [3 Marks]

Q3.   What is the function of bearings in Concrete or Railway bridges? What are basis of selection of bearings?   [3 Marks]

Q4.   What are the load distribution theories used in girders of Tee beam and slab bridge. Explain Courbon's theory with the help of neat sketch.   [3 Marks]

Q5.   Find the maximum bending moment and Max. Shear Force (all load combination) in the longitudinal girder having following data:- [5 Marks]

- Effective span-18m,
- No. of Longitudinal Girder = 3
- No. of cross girders = 6
- Dead load of each cross girder = 90 kN
- UDL on longitudinal Girder because of bridge deck = 25kN/m
- Carriage way width-7.5m,
- Kerb- 600 mm on either side.
- IRC loading – Class AA [Tracked]

Q6.   Verify the stability of the abutment for the following data: [7 Marks]

- Top width – 1.5 m
- Height – 4.0 m
- Back batter – 1 in 6
- Front face abutment is vertical
- Type of material – Stone masonry($\gamma = 24$ KN/m^3
- Unit wt. of soil - 18 KN/m^3
- Angle of repose – 30°
- Superstructure – T-beam bridge of span 15.0 m
- Loading – IRC class A-A (tracked)

Assume suitable dimensions for components of the superstructure.

Q7. Design an elastomeric bearing for following data: [5 Marks]
- Dead load reaction per bearing = 230 KN
- Live load reaction per bearing = 480 KN
- Longitudinal force = 38 KN
- Effective span of bridge = 16.0 m
- Total estimated shear strain due to creep, shrinkage and temp. = 6×10^{-4}
- Estimated rotation at bearing of the girder due to dead load and live loads = 0.002
- Concrete for T-beam and bed block = M20

Q8. A well foundation is to be designed for an abutment of 10 x 5 m base dimensions. The well is founded on sandy soil, the following data is [6 Marks]
- Height of bearing above maximum scour level = 28 m
- Permissible horizontal displacement of the bearing level = 50 mm
- Height of abutment = 6.0 m
- Total vertical load including weight of abutment and well = 20,000 KN
- Total Lateral load at scour level = 400 KN
- Submerged unit weight of soil = 10 KN/m³

Design the well and verifying stresses in the steining. Also sketch the reinforcement details

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