

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- 2016

M.Tech 4th Semester

COURSE CODE: 11M1WCE133

MAX. MARKS: 25

COURSE NAME: Bridge Engineering

COURSE CREDITS: 03

MAX. TIME: 1:30 Hr

Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means. Suitably assume any missing data. IS 456-2000 code is allowed.

1. Design a reinforced concrete slab culvert for a national highway crossing to suit the following data:

Carriage way : Two lane, Foot paths : 1m on either side, Clear span : 6m, Wearing coat : 80mm, Width of bearing : 400mm, Materials : M-25 Grade concrete and Fe-415 Grade HYSD bars, Loading : IRC class AA tracked Vehicle, adopt overall depth of slab as 500mm, use 20mm diameter bar with clear cover of 30mm, take value of $k = 2.84$

- (a) Design the reinforced concrete slab deck and sketch the details of reinforcements in the longitudinal and cross section of the slab. The design should conform to the specifications of IRC 6-2000 and IRC 21-2000 codes. (b) Do the check for shear stresses. (c) Also compare the design live load moments for reinforced concrete slab culvert using IRC class A loadings. **[7+2+4 = 13 marks]**

2. Design a pipe culvert (No. of pipes and bedding) through a road embankment of height 6m. The width of the road is 7.5m and the formation width is 10m. The side slope of embankment is 1.5:1. The maximum discharge is $6\text{ m}^3/\text{s}$. The safe velocity is 3 m/s. Class AA tracked vehicle is to be considered as live load. Assume bell-mouthed entry. Given $C_e = 1.5$, $C_s = 0.010$, the unit weight of soil = 20 kN/m^3 and three edge bearing strength for NP3 pipe with internal dia (1m) and external dia (1.23m) as 72 kN/m. **[6 marks]**

3. Calculate the design loads (DL, LL and Lateral Pressure) for the box culvert having inside dimensions of 3m X 3m. This culvert is subjected to a dead load of 14 kN/m^2 and a live load of IRC class AA tracked vehicle. The unit weight of soil as 18 kN/m^3 , the angle of repose of soil is 30 deg., Road Width is 7.5m and span is 3.3m. Take slab and wall thickness as 300mm, wearing course 80mm and value of $k = 2.6$ **[6 marks]**