

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATIONS-2023

B.Tech-Vth Semester (Civil)

COURSE CODE (CREDITS): 18B11CE511(3)

MAX. MARKS: 35

COURSE NAME: Highway Engineering

COURSE INSTRUCTORS: Dr. Amardeep

MAX. TIME: 2 Hour

Note: All questions are compulsory. Marks are indicated against each question in square brackets.

Q1. At a right angled intersection of two roads, Road 1 has four lanes with a total width of 12 m and Road 2 has two lanes with a total width of 6.6 m. The volume of traffic approaching the intersection during deign hour are 900 an 743 PCU/hour on the two approaches of road 1 and 278 and 180 PCU/hour on the two approaches of Road 2. Design the traffic signals timings as per IRC guidelines. [CO5] [6]

Q2. Discuss in detail about the different warrants required for the traffic control signal installation. [CO5] [4]

Q3. Solve the following:- [CO1]

- a) Minimum green time required for vehicular for any of the approach is ___seconds
- b) Gradient on a highway is 1 in 20. Radius of the curve is 200 m. calculate grade compensation.
- c) Intermediate sight distance is equal to ___times SSD
- d) As per IRC the maximum superelevation that can be provided on hill road not bound by snow is ___
- e) Define gradient and state any four types of gradients. (5X1 =5)

Q4. Please specify the PCU values of Bus, Car and Two Wheeler at signalized intersection and Kerb parking for an urban road. [CO3] [1]

Q5. Please discuss the application of origin and destination study in details and make a list of the different methods of the same. [CO3] [2]

Q6. The speed of overtaking and overtaken vehicles are 80 kmph and 60 kmph respectively on a two way traffic road. If the acceleration of the overtaking vehicle is 0.9 m/sec^2 , calculate the safe overtaking sight distance. [CO2 & 3] [3]

Q7. A major district road of WBM is to be constructed for a width of 3.8 m in a heavy rainfall region. Calculate the height of the crown with respect to the edges. [CO3] [1]

Q8. A car follows a slow moving truck (travelling at a speed of 20 m/s) on a two-lane two-way highway. The car reduces its speed to 10 m/s and follows the truck maintaining a distance of 16

m from the truck. On finding a clear gap in the opposing traffic stream, the car accelerates at an average rate of 4 m/s^2 , overtakes the truck and returns to its original lane. When it returns to its original lane, the distance between the car and the truck is 16 m. The total distance covered by the car during this period (from the time it leaves its lane and subsequently returns to its lane after overtaking). [CO3]

a. 64 m b. 72 m c. 128 m d. 144 m [3]

Q9. Design a bituminous pavement with granular base and subbase layer using the following data:

- i. Four lane divided highway
- ii. Initial traffic = 5000 cvpd (two – way)
- iii. Traffic growth rate = 6%
- iv. Design life = 20 years
- v. VDF = 5.2 (same for both direction)
- vi. CBR = 7%
- vii. Marshall mix design carried out on the bituminous mix to be used in the bottom bituminous layer (DBM) for an air void content of 3% resulted in an effective bitumen content (by volume) of 11.5%. [CO-3] [6]

Q10. A road in a hilly terrain is to be laid at a gradient of 4.5%. A horizontal curve of radius 100 m is laid at a location on this road. Gradient needs to be eased due to combination of curved horizontal and vertical profile of the road. What will be the compensated gradient (in %) as per IRC? [CO-4][4]