

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- 2015

B.Tech. Vth Semester

COURSE CODE: 10B11CE511

MAX. MARKS: 15

COURSE NAME: Highway Engineering

COURSE CREDITS: 4

MAX. TIME: 1 HR

Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means. Assume necessary data as per IRC.

1. A truck with C.G at $X = 1.4$ and $Y = 1.7$ m taken from the outer wheel is travelling on a curved road radius 200 m and super elevation as 0.05. Determine the maximum safe speed to avoid both slipping and overturning, assuming that the coefficient of sliding friction is 0.15. Sketch, explain and derive the expression for the condition when the overturning is likely to happen. [6]
2. A passenger car weighing 2 tonnes is required to accelerate at a rate of 2 m/sec^2 in the first gear from a speed of 10 kmph. The gradient is +3% and the road has a blacktopped surface with the coefficient of rolling resistance equal to 0.02. The frontal projection area of the car is 2.15 m^2 . The coefficient of air resistance is 0.39 kg/m^3 . The car tyres have a radius of 0.33 m. The inflation pressure reduces this by a factor 0.935. The rear axle gear ratio is 3.82 : 1 and the first gear ratio is 2.78 : 1. Assume a transmission efficiency of 0.90. Calculate:
 - a. The engine power (in Watts) needed
 - b. The speed of the engine in R.P.M. [2 + 1 = 3]
3. A two lane pavement on a national highway in hilly terrain (snow bound) has a curve of radius 60 m. The design speed is 40 kmph.
 - a. Determine the length of the transition curve.
 - b. Determine the total length of the curve and tangent length if the deflection angle is 60° . Make suitable assumptions as per IRC. [1.5 + 1.5 = 3]
4. What are the standards for road gradient in India? Explain where (i) ruling, (ii) limiting and (iii) exceptional gradients are used? [1 + 1 + 1 = 3]