CT-505/TE/5th Sem/2018/M

TRANSPORTATION ENGINEERING

Full Marks – 70

Pass Marks – 28

Time – Three hours

The figures in the margin indicate full marks for the questions.

PART – A

Marks – 25

Question numbers 1(i) to 1(xv) carry 1 mark each.

1. Question numbers 1(i) to 1(xv) have four options out of which only one option is correct. Choose the correct answer from the available options :

   (i)   Los Angels test is used to find out

       (a)   Abrasion value

       (b)   Impact test value

       (c)   Crushing strength

       (d)   Attrition test value

[Turn over

(ii) The function of an expansion joint in rigid pavement is to

    (a) Relieve wraping stress

    (b) Relieve shrinkage stress

    (c) Relieve stresses due to expansion

    (d) Allow free expansion

(iii) The maximum limit for water adsorption for aggregate suitable for road construction is

    (a) 0.4%   (b) 0.6%

    (c) 0.8%   (d) 1.0%

(iv) The ideal shape of transition curve is

    (a) Clothoid

    (b) Cubic spiral

    (c) Cubic parabola

    (d) Lamniscate

(v) Any gradient of a road is said to be an exceptional gradient, if it is

(a) More than ruling gradient

(b) Less than average gradient

(c) More than floating gradient

(d) Less than minimum gradient or more than maximum gradient.

(vi) Charles Vignoles invented the flat footed rails in

(a) 1814   (b) 1836

(c) 1846   (d) 1856

(vii) Three points A, B and C 500 m apart on a straight road have 500m, 505m and 510m as their reduced levels. The road is said to have

(a) No gradient between A and C

(b) A positive gradient between A and C

(c) A negative gradient between A and C

(d) A negative gradient between A and B

(viii) Maximum wheel base distance provided on Indian B.G. tracks, is

(a) 4.096 m

(b) 5.096 m

(c) 6.096 m

(d) None of these

(ix) Excessive camber on pavement may cause

(a) Deterioration of central portion

(b) Slip of the speedy vehicles towards the edges

(c) Erosion of the beams

(d) All of the above

(x) Selection of the routes of highways depends upon

(a) Feasibility of attaining ruling gradient

(b) Avoidance of cutting hard rocks.

(c) Minimum number of bridges

(d) All of the above

(xi) Design of horizontal curves on highways, is based on

(a) Design speed of vehicles

(b) Permissible friction on the road surface

(c) Permissible centrifugal ratio

(d) All of the above

(xii) Set back distance is the distance between

(a) Road land boundary and building line

(b) Road land boundary and control line

(c) Building line and control line

(d) None of the above

(xiii) The group index for a soil, whose liquid limit is 40 per cent, plasticity index is 10 per cent and per centage passing 75 micron IS sieve is 35, is

(a) 0   (b) 3

(c) 5   (d) 7

(xiv) Flexibile pavement distributed the wheel load

(a) Directly to subgrade

(b) Through structural action

(c) Through a set of layers to the sub-grade

(d) None of the above

(xv) Write the correct statement from the following :

(a) Various geometric design features and generally guided by ruling design speed

(b) The design speed for a given highway should preferably be uniform

(c) Abrupt change in the design speed should not be permitted

(d) All of the above

Question numbers 2(i) to 2(v) carry 2 marks each.

2. Choose the correct option from the available answer :

(i) If degree of a road curve is defined by assuming the standard length of an arc as 30 metres, the radius of 10 curve is equal to

(a) 1719 m   (b) 1146 m

(c) 1046 m   (d) 1619 m

(ii) A district road with a bituminous pavement has a horizontal curve of 1000 m for a design of 75 k/hr. The super elevation is

(a) 1 in 40   (b) 1 in 50

(c) 1 in 60   (d) 1 in 70

(iii) The total length of a valley formed by two gradients − 3% and + 2% curve between the two tangent points to provide a rate of change of centrifugal acceleration 0.6 m/sec2, for a design speed 100 km/h, is :

(a) 16.0 m   (b) 42.3 m

(c) 84.6 m   (d) None of these.

(iv) Alignment of highways in hilly regions is decided on

(a) long stretch of very hard cutting

(b) number of river crossings

(c) natural unstable areas

(d) All of the above

(v) If the rate of change of the super-elevation along a curved portion of a 7 metre wide road is 1 in 150 and the maximum super elevation allowed is 1 in 15, the maximum length of the transition curve to be provide at either end is

(a) 65 m (b) 70 m

(c) 75 m (d) 80 m

PART – B

Marks – 45

Answer any *three* questions.

3. What is sight distance ? Determine the expres for overtaking sight distance in a highway.

5+10

4. Explain the special consideration for highway alignment in hilly areas. What is PIEV theory ?

$$10+5=15$$

5. Calculate the minimum sight distance required to avoid a head on collision of two cars approaching from the opposite directions at 90 and 60 km/hr. Assume a reaction time of 2.5 seconds, coefficient of friction of 0.7 and a brake efficiency of 50 per cent, in either case.

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6. What is superelevation of road ? Determine the expression for superelevation and radius of curve.

$$5+10=15$$