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**Reg. No. :**

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**Question Paper Code : 53104**

B.E./B.Tech. DEGREE EXAMINATION, NOV 2018

Civil Engineering

15UCE304 -HIGHWAY AND RAILWAY ENGINEERING

(Regulation 2015)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. \_\_\_\_\_ are a separate class of highways with superior facilities and design standards and are meant for through traffic having very heavy volume of traffic. CO1- R  
(a) National highway    (b) Express way    (c) Toll roads    (d) State highway
2. Where the topography of a place compels adopting steeper gradient than ruling gradient \_\_\_\_\_ gradient is used. CO1- R  
(a) Limiting    (b) Exceptional    (c) Minimum    (d) Maximum
3. Temperature stress in concrete pavements is caused due to \_\_\_\_\_ CO2- R  
(a) Repeated application of load  
(b) Change in weather  
(c) Due to expansion and contraction of slab  
(d) Temperature differential between top and bottom of slab
4. The Los Angeles abrasion value of good aggregate acceptable for wearing surface should be CO2- R  
(a) Less than 30%    (b) More than 30%    (c) More than 40%    (d) Zero
5. Ravelling is caused due to CO3- R  
(a) Insufficient binder content    (b) Excessive binder content  
(c) Use of low viscosity bitumen    (d) Heavy channelised traffic

6. Spraying of bitumen binder of low viscosity over a granular or non granular is called application of \_\_\_\_\_ CO3- R  
 (a) Tack coat (b) Prime coat (c) Seal coat (d) Stabilisation
7. Longitudinal movement of rail with respect to sleepers in track is known as CO4- R  
 (a) Kink (b) Fish plate (c) Creep (d) Coning
8. \_\_\_\_\_ is used in rail joints to maintain continuity of rail. CO4- R  
 (a) Fish plate (b) Coning (c) Sleeper (d) Ballast
9. \_\_\_\_\_ signal is provided as the first stop signal at a station. CO5- R  
 (a) Home (b) Outer (c) Semaphore (d) Repeater
10. Reception, sorting and departure of trains is done at CO5- R  
 (a) Marshalling yard (b) Goods yard  
 (c) Passanger yard (d) Locomotive yard

PART – B (5 x 2= 10Marks)

11. List the factors that control highway alignment. CO1- R
12. State the functions of base layer. CO2- R
13. List the use of geo textiles. CO3- R
14. Define cant deficiency. CO4- R
15. List the any four methods for controlling movement of trains. CO5- R

PART – C (5 x 16= 80Marks)

16. (a) (i) Explain the various surveys to be conducted to locate a new highway. CO1- U (10)
- (ii) Discuss how obligatory points control highway alignment. CO1- U (6)

Or

- (b) While aligning a highway in built-up area it was necessary to provide a circular curve of radius 325m. The design speed is 65kmph, length of wheel base of largest truck = 6m, width of pavement = 10.5m, rate of introduction of super elevation = 1 in 150, Assume the super elevation is provided by rotating pavement about centre line. Design the length of transition curve. CO1- App (16)
17. (a) Enumerate the step by step procedure for bituminous mix design by Marshal stability method. CO2-U (16)
- Or
- (b) (i) Calculate the ESWL of a dual wheel load assembly carrying 2044 kg each for trial pavement thickness values of 150,200,250 mm. Centre to centre spacing between the two tyres = 270mm and clear gap between the walls of tyre = 110mm. CO2- App (8)
- (ii) Calculate the corner load stress from the following data. CO2- App (8)  
Design wheel load = 7000kg, radius of contact = 17.25 cm, modulus of sub grade reaction =  $30\text{kg/cm}^3$ , elastic modulus of pavement material =  $3 \times 10^5 \text{kg/cm}^2$ , poisons ratio of concrete = 0.15, thickness of slab = 28cm. Assume any suitable data if required.
18. (a) Mention the causes for various failures in cement concrete pavement. CO3- U (16)
- Or
- (b) Explain the various steps involved in construction of bituminous and cement concrete roads. CO3- U (16)
19. (a) Draw a neat sketch of permanent way and explain the functions of various components. CO4- U (16)
- Or
- (b) Calculate the length of transition of curve for a design speed of 90kmph on a broad gauge track with radius of curve 496m. Assume cant deficiency as 7.9cm. CO4- App (16)

20. (a) Calculate all the necessary data to set out a 1 in 8.8 turnout taking off from a straight B.G. track with a curve starting from the toe of the switch. Given that heel divergence = 11.4cm. CO5- App (16)

Or

- (b) (i) Explain the various methods of plate laying CO5- U (8)
- (ii) Enumerate the various methods for maintenance of high speed track. Explain any one method. CO5- U (8)