Marks Scored:

KATHMANDU UNIVERSITY
End Semester Examination
February/March, 2019

Level : B.E.
Year : IV

Course : CIEG 401
Semester: I

Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No.:

Date 05 MAR 2019

SECTION "A"

[20 Q. × 0.5 = 10 marks]

Encircle the most appropriate answer among the given choices.

1. Banepa - Panauti road is an example of
   a) National Highway
   b) Feeder Road
   c) District Road
   d) Urban Road

2. Higher the CBR value of subgrade material
   a) higher will be thickness of pavement
   b) optimum will be bitumen content
   c) lesser will be thickness of pavement
   d) have no relation with thickness of pavement

3. Enoscope method is one of the method of
   a) spot speed measurement
   b) speed and delay study
   c) origin and destination study
   d) parking study

4. The percentage cross slope for steep type terrain ranges from
   a) > 65 b) >60 c) 25-65 d) 25-60

5. The type of failure in flexible pavement which occurs due to consolidation of one or more layers of pavement is
   a) rut formation b) pot holes c) shear failure d) reflection cracking

6. Alternate bay method is one of the methods of road construction for
   a) water bound macadam
   b) bituminous penetration macadam
   c) Premix bituminous pavement
   d) cement concrete pavement

7. Which type of road construction uses heavy foundation stones of varying thickness?
   a) Roman Construction
   b) Macadam Construction
   c) Telford Construction
   d) Tresaguet Construction

8. The maximum limit of grade compensation on horizontal curve for a highway with curve radius of 15 m is
   a) 1% b) 3% c) 4% d) 5%

9. A dense sand bitumen premix of compacted thickness usually laid over cement concrete pavement to provide an excellent riding surface is
   a) sheet asphalt
   b) seal coat
   c) mastic asphalt
   d) asphalt concrete

10. The resisting length will generally be high in the case of
a) ridge route b) river route c) valley route d) hill route

11. In a design of filter material for sub-surface drainage, to prevent the piping of foundation soil
a) $\frac{D_{15}\text{ of filter}}{D_{15}\text{ of foundation}} > 5$
b) $\frac{D_{15}\text{ of filter}}{D_{15}\text{ of foundation}} < 5$
c) $\frac{D_{15}\text{ of filter}}{D_{85}\text{ of foundation}} < 5$
d) $\frac{D_{15}\text{ of filter}}{D_{85}\text{ of foundation}} > 5$

12. Bridge is a type of
a) retaining structure
b) channeling structure
c) divisional structure
d) cross drainage structure

13. Maximum gap of expansion joint should not exceed
a) 1.5 cm b) 2.0 cm c) 2.5 cm d) 3.0 cm

14. The structure constructed along the direction of flow to dissipate the water energy and protect the bank from erosion is
a) guide bund b) retaining wall c) check dam d) spurs

15. In bituminous pavement, optimum bitumen content in the mix is determined using
a) GI method b) Marshal method c) IRC method d) CBR method

16. Particle shape of aggregate mass is determined by
a) crushing value
b) abrasion value
c) impact value
d) angularity number

17. During engineering survey of highway location, the alignment is finalized during
a) map study
b) reconnaissance
c) preliminary survey
d) detail survey

18. In a highway, if the average headway between vehicles is 3.6 sec, then the capacity of roadway is
a) 1,000 PCU b) 3,600 PCU c) 12,960 PCU d) 36,000 PCU

19. The type of cracking observed in bituminous pavement overlaid over existing cement concrete pavement is
a) shear cracking
b) reflection cracking
c) map cracking
d) longitudinal cracking

20. The element of highway cross-section where road sign and signals are generally fixed is
a) crown b) right of way c) side slope d) shoulder

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Level : B. E.
Year : IV
Time : 2 hrs. 30 mins.

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Semester: I
F. M. : 40

SECTION "B"
[5Q × 8 = 40 marks]

Attempt *ALL* questions. Assume suitable data where necessary as per standards.

1. a. Explain in detail the various typical cross-sections of hill roads with appropriate figures. [4]
   b. A six lane carriageway has a curve of 250 m length and 400 m radius. The safe stopping sight distance and overtaking sight distance are 150 m and 350 m respectively. Calculate the minimum set-back distance from the inner edge of the road to the edge of the obstruction to ensure safe visibility for the both cases of sight distances. [4]

2. a. Explain the negative impact of water content in bitumen. Explain the reasons behind the extensive use of bitumen as a highway material. List out the desirable properties of good bituminous mix. [1+2+1]
   b. At what conditions designer needs to introduce cross drainage in highway alignment? In what situations causeways are preferred? Explain various type of causeways with figures. [1+1+2]

3. a. Explain the various highway maintenance works with proper examples. Explain mud pumping failure in rigid pavement. [2+2]
   b. Explain briefly the construction steps for water bound macadam pavement. [4]

4. a. List out the various traffic studies which are generally carried out. Define traffic island and explain the features of various types of traffic islands with figures. [1+3]
   b. List out the qualities of good pavement. Design the spacing between the expansion and contraction joints for RCC slab of 3.5 m width and thickness of 20 cm. The maximum increase in temperature is expected to be 26° C after the construction of pavement. Reinforcement bars of diameter 1 cm are provided at 0.3 m spacing across the width. Assume thermal coefficient = 10 X 10^{-6} per °C, Unit weight = 2400 kg/m^3, allowable stress in tension during initial period of curing = 0.8 kg/cm^2, allowable tensile stress in steel = 1200 kg/cm^2, coefficient of friction of interface = 1.4. [1+3]

5. Write short notes on (*ANY FOUR*) [4 × 2 = 8]
   a. Components of bridge
   b. Highway alignment and its type
   c. Applications of origin and destination study
   d. Gradient and its type
   e. Features of Macadam's construction
   f. Urban road network