KATHMANDU UNIVERSITY
End Semester Examination [C]
May/June, 2019

Marks Scored:

Level : B.E.
Year : IV

Course : CIEG 401
Semester: I

Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No.:

Date 30 MAY 2019.

SECTION "A"

[20 Q. × 0.5 = 10 marks]

Encircle the most appropriate answer among the given choices.

1. The maximum dimensions (L, B, H) of a vehicle considered for the design of roads in Nepal are
   a) 18m, 4.75m, 2.5m
   b) 18m, 2.5m, 4.75 m
   c) 16m, 2.5m, 4.75m
   d) 10m, 3.5m, 5.50m

2. The critical combination of stresses taken for design of corner region in rigid pavement are
   a) load stress + warping stress + frictional stress
   b) load stress + warping stress – frictional stress
   c) load stress + warping stress
   d) load stress ± frictional stress

3. When the speed of traffic flow becomes zero then
   a) traffic density attains maximum value whereas traffic volume become zero
   b) traffic density becomes zero whereas traffic volume attains maximum value
   c) traffic density and traffic volume both attains maximum value
   d) traffic density and traffic volume both become zero

4. The effective length of the road taken into consideration for calculating the work done by vehicle during travelling from one place to another is termed as
   a) chain length
   b) resisting length
   c) ruling length
   d) nominal length

5. The type of failure in flexible pavement which occurs due to lack of binding with lower layer is
   a) pot hole
   b) rut formation
   c) map cracking
   d) reflection cracking

6. For the construction of WBM roads, the correct sequence of operations after spreading coarse aggregate is
   a) dry rolling, wet rolling, application of screening and application of filler
   b) dry rolling, application of filler, wet rolling and application screening
   c) dry rolling, application of screening, application of filler and wet rolling
   d) dry rolling, application of screening, wet rolling and application of filler

7. In Macadam road construction subgrade was prepared with cross-slope of
   a) 1:56
   b) 1:46
   c) 1:36
   d) 1:26

8. The minimum radius of horizontal curve for the highway alignment with design speed of 120 kmph is
a) 65 m b) 125 m c) 255 m d) 515 m

9. In WBM roads, the binding material is
a) stone dust b) brick dust c) cement d) sand

10. If the location of road bed is in steep hill slope and retaining wall may have to be very high. In such condition road bed is designed as
a) semi-bridge b) flat form c) bench type d) box type

11. _____ culvert provided at the places with weak bed soil.
a) Slab b) Arch c) Box d) Pipe

12. Which one of the following is the cross-drainage structure?
a) Semi bridge b) Catch drain c) Side drain d) Bridge

13. For the design wheel load of 4100 kg and tyre pressure of 7 kg/cm^2 the radius of wheel load distribution will be
a) 169.41 cm b) 24.20 cm c) 13.65 cm d) 6.65 cm

14. The cross drainage structure provided at road intersection for passage of drain water across the roads is
a) culvert b) inverted syphon c) causeway d) aqueduct

15. Which of the following test measures the toughness of road aggregates?
a) Crushing test b) Impact test c) Los Angeles test d) Abrasion test

16. Marshall test is performed to determine
a) strength of aggregate
b) CBR value of aggregate
c) grade of bitumen
d) optimum bitumen content for bituminous mix

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

18. During speed study the time taken by test vehicle to travel 500 m section of road was 3 minutes with delay of 1 minute at intersection. The running and journey speed of test vehicle will be respectively as
a) 15 and 10 kmph b) 10 and 15 kmph c) 10 and 7.5 kmph d) 7.5 and 10 kmph

19. The renewal of surface course of pavement surface is
a) routine maintenance b) periodic maintenance
c) repair work d) special repair

20. The stopping distance travelled by a moving vehicle upon seeing the obstacle on road during reaction time of driver is termed as
a) braking distance b) sight distance c) stopping distance d) lag distance

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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. Draw a typical highway cross-section showing its various elements. A radius of 120 m has to be provided at a locality due to site restrictions in a highway with design speed of 80 kmph. Design the super elevation. Should there be restriction in speed? [1+3]
   b. Explain the importance of ring road in urban road network. Why Macadam's method of road construction is considered better and more scientific compared to the previous methods? [2+2]

2. a. Define hill roads and explain it necessity in context on Nepal. Also, explain the importance of hair pin bends in hill roads. [2+2]
   b. Explain the construction steps of cement concrete pavement in detail. [4]

3. a. At what conditions designer needs to introduce bridge in highway alignment? Briefly explain the different components of bridge with appropriate sketch. [2+2]
   b. Explain the various methods of sub-surface drainage with well label figures. [4]

4. a. List out the various traffic control devices used in roadways. Explain any one in detail with figures. [1+3]
   b. A cement concrete slab of thickness 20 cm is constructed over a granular sub-base having modulus of reaction 15 kg/cm^2 per cm deflection of slab. The average temperature difference between top and bottom of slab during day and night is found to be 18°C. The spacing between the transverse contraction joints is 4.5 m and that between longitudinal joints is 3.5 m. The design wheel load is 5100 kg, radius of contact area is 15 cm, modulus of elasticity for concrete is 3 X 10^5 kg/cm^2, Poisson's ratio is 0.15, coefficient of thermal expansion for concrete is 10 X 10^{-6} per °C, friction coefficient is 1.5 and Bradbury coefficients given in table below. Find the worst combination of stresses in the slab. [4]

$\frac{L_x}{l}$ or $\frac{L_y}{l}$	4	5	6	7	8	9
C_x or C_y	0.440	0.720	0.920	1.030	1.075	1.080

5. Write short notes on (*ANY FOUR*) [4 × 2 = 8]
   a. Ductility test of bitumen
   b. Types of traffic capacity
   c. Setback distance
   d. Mud pumping
   e. Routine maintenance
   f. Ideal highway alignment