KATHMANDU UNIVERSITY
End Semester Examination [C]
July, 2017

Marks Scored:

Level : B. E. /B. Tech.
Year : IV
Course : CIEG 401
Semester: I
Exam Roll No. :
Time: 30 mins.
F.M. : 10
Registration No.:
Date JUL 10 2017

SECTION "A"

[20Q. × 0.5=10 marks]

Choose the most appropriate answer among the given choices.

1. The large difference of temperature between the top and the bottom of the slab causes
   a) cracking b) warping c) hardening d) crazing

2. Of all the forces stressing a concrete pavement, the most significant are those imposed by the
   a) change in temperature
   b) change in moisture
   c) wheel loads
   d) force of friction

3. Which of the following test is conducted to detect cracked bitumen?
   a) Spot test
   b) Loss on heating test
   c) Solubility test
   d) Float test

4. The city roads providing an access to residence, business and other buildings are called
   a) collector street b) local street c) arterial street d) sub-arterial street

5. The highest point on road surface is called
   a) crown b) cant c) camber d) berm

6. The most suitable equipment for compacting bituminous pavement is
   a) vibrator
   b) sheep foot roller
   c) smooth wheeled roller
   d) pneumatic tyredroller

7. Weight of a vehicle affects
   a) passing sight distance
   b) pavement thickness
   c) extra widening
   d) width of lanes

8. For establishing upper speed limit for traffic management, the speed used is
   a) 15^{th} percentile b) 50^{th} percentile c) 75^{th} percentile d) 85^{th} percentile

9. The essentialgradient, which has to be provided for the purpose of road drainage, is called
   a) minimum gradient
   b) floating gradient
   c) exceptional gradient
   d) ruling gradient

10. The percentage cross slope for mountainous type terrain ranges from
    a) 25-60 b) 10-25 c) 0-10 d)>60

11. In order to prevent piping in filter material, the condition to be fulfilled is

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. The dowel bars are used in rigid pavements for

a) resisting tensile stresses b) resisting shear stresses
c) resisting bending stress d) transferring load from one portion to another

13. Narrow track prepared along alignment of hill road to enable access for inspection during location of route is

a) box cut b) bench cut c) trace cut d) flat form

14. Coefficient of friction is less when the pavement surface is

a) Smooth and dry b) smooth and wet
c) rough d) dry

15. In the premix method of bitumen road construction, the aggregate is also heated

a) for easy spreading b) to get a homogenous mix
c) for easy handling d) to reduce bitumen requirement

16. The percentage by weight of particle whose greatest dimension is greater than 1.8 times their mean dimension is known as

a) shape index b) flakiness index
c) angularity index d) elongation index

17. First operation during the detailed survey of a hill road is

a) adjustment of alignment along with curves
b) derivation of longitudinal and cross-sections
c) fixation of B.M
d) hydrological and soil survey

18. Which one of the following is not a warning sign?

a) No entry b) Curve ahead c) U-turn d) Narrow bridge ahead

19. The bridge having its floor flush with bed of stream is known as

a) culvert b) causeway c) viaduct d) minor bridge

20. The maximum height of vehicle considered for design of roads in Nepal is

a) 3.5 m b) 3.75 m c) 4.5 m d) 4.75 m

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SECTION "B"

Assume suitable data where necessary.

1. a. What are the salient features of early Roman Roads? How do these differ from the present day road construction? [2+2]
   b. What are the various requirements of an ideal highway alignment? Discuss in brief the various factors controlling highway alignment with suitable sketches. [2+2]

2. a. Explain the importance of hair pin bends in hill roads.The stopping sight distance required for a highway is found to be 90m. There is a horizontal curve of radius 400 m and length 200 m on this highway. Compute the setback distance required from the center line on the inner side of the curve so as to provide for stopping sight distance. The distance between the center line of the road and the inner lane is 1.9m. [2+2]
   b. Describe the various methods of sub-surface drainage with neat sketches. [4]

3. a. Explain origin and destination study with its applications. Discuss how it is conducted. [2+2]
   b. Explain briefly the construction steps for water bound macadam pavement. [4]

4. a. State the importance of extra widening required on a horizontal highway pavement. Calculate extra widening required for a pavement of 7 m on a horizontal curve of radius 300 m, if the longer wheel base of vehicle on the road is 6.5 m. Design speed is 100 kmph. [2+2]
   b. Design the size and spacing of dowel bars at the expansion joints of a cement concrete pavement of thickness 26cm for design wheel load of 5100 kg. Joint width is 2.5 cm, permissible shear and flexural stresses in dowel bar are 1000 kg/cm^2 and 1400 kg/cm^2 respectively and permissible bearing stress in cement concrete is 100 kg/cm^2. [4]
   Take $E_{Concrete} = 3X10^5$ kg/cm^2, $\mu = 0.15$, K=8 kg/cm^3

5. Write short notes on (*ANY FOUR*) [4 × 2= 8]
   a. Traffic signs
   b. Softening point test of bitumen
   c. Components of bridge
   d. Typical failures in rigid pavement
   e. Highway maintenance works