University of Mumbai

Civil Engineering Examination

Sub: CEDLO 7043/ Pavement Subgrade & Material Year/Sem: - BE/ VII Sem

Max. Marks: 80   Duration: - 2Hrs

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Q1. Attempt all the MCQS   **(20 X 2 mark = 40 marks)**

1. Group Index is computed using which of the below formula_____
   a) $GI = 0.2a+0.005ac+0.01bd$
   b) $GI = 0.1a+0.005ac+0.02bd$
   c) $GI = 0.2a+0.001ac+0.02bd$
   d) $GI = 0.1a+0.001ac+0.05bd$

2. For two soil samples, If Liquid limit (LL) is 44% and 55%, Plastic Limit (PL) is 20% and 35% and if natural water content (w) is 30% and 50%, what will be Liquidity Index ___
   a) 32 & 55
   b) 55 & 32
   c) 42 & 75
   d) 75 & 42

3. If liquid limit 36%, plastic limit as 23% and % passing 75 microns IS sieve = 56, then group Index is_____
   a) 4
   b) 5
   c) 6
   d) 7

4. The correction to be applied for modulus of subgrade reaction for saturation is_____
   a) $K_{sat} = (du/ds)*K$
   b) $K_{sat} = (ds/du)*K$
   c) $K_{sat} = (du/ds)*K_b$
   d) $K_{sat} = (ds/du)*K_b$

5. The seating load for plate load test is_____
   a) 2.0 kN/m^2
   b) 7.0 kN/m^2
   c) 10.0 kN/m^2
   d) 12.0 kN/m^2

6. The mould size used in the CBR Test is_____
   a) 15 cm dia. & 17 cm height
   b) 15 cm dia. & 17.5 cm height
   c) 17 cm dia. & 15 cm height
   d) 17.55 cm dia. & 15 cm height

7. What will be the corrected value of modulus of modulus of subgrade reaction considering correction to be applied for bending of plates, if $k = 3 \text{ kg/cm}^2/\text{cm}$
   a) $2.76 \text{ kg/cm}^2/\text{cm}$
   b) $2.80 \text{ kg/cm}^2/\text{cm}$

c) 2.70 kg/cm^2/cm
d) 2.82 kg/cm^2/cm

8. If the aggregates are exceptionally strong then they are having impact value which is?
   a) less than 10%
   b) less than 15%
   c) less than 30%
   d) greater than 30%

9. 1000g aggregate is taken for shape test on which 500g aggregate are flaky from remaining aggregate 200g are elongated, calculate elongated index.
   a) 40
   b) 60
   c) 50
   d) 20

10. The penetration test on bitumen is used for determining its
    a) Grade
    b) Ductility
    c) Viscosity
    d) Stability

11. The ductility value of bitumen for suitability in road construction should not be less than_____?
    a) 30cm
    b) 40cm
    c) 60cm
    d) 75cm

12. Which of the below method is used for blending aggregates from more than 3 sources?
    a) Trial & Error
    b) Graphical
    c) Triangular Chart
    d) Rothfutch's Method

13. Volume of mineral aggregate is?
    a) $V_V + V_b$
    b) $V_V - V_b$
    c) $V_V * V_b$
    d) V_V / V_b

14. For finding short term aging of bitumen which test is preferred
    a) Flash & Fire Test
    b) Rolling Thin Film Oven
    c) Penetration Index
    d) Pressure Aging Vessel

15. The most fluid cutback is
    a) RC 70
    b) MC 30
    c) SC 250

d) RC 0

16. In the marshall method of mix design, the coarse aggregates, fine aggregates, filler material and bitumen having respective specific gravities of 2.62,2.72,2.70 and 1.02, are mixed in the ratio of 55, 34.6,4.8 and 5.6 percent, respectively. The theoretical specific gravity of the mix would be
    a) 2.36
    b) 2.40
    c) 2.44
    d) 2.50

17. The Viscosity of VG40 grade bitumen at 60 degree Celsius in (poise)is_____
    a) 2400-3600
    b) 3200-4800
    c) 1600-2400
    d) greater than 4800

18. In a Marshall sample, the bulk specific gravity of mix and aggregates are 2.324 and 2.546 respectively. The sample includes 5% of bitumen (by total weight of mix) of specific gravity 1.10. The theoretical maximum specific gravity of mix is 2.441. The void filled with bitumen in the Marshall sample (in %) is
    a) 68.82
    b) 60.55
    c) 52
    d) 72.89

19. During a CBR test, the load sustained by a remoulded soil specimen at 5mm penetration is 50kg, the CBR value of the soil will be.
    a) 10%
    b) 5%
    c) 3.6%
    d) 2.4%

20. Determine specific gravity of combine aggregate in bituminous mix having maximum theoretical specific gravity of 2.7. The bitumen content is 9% by weight of mix and its specific gravity is 1%.
    a) 3
    b) 2.65
    c) 3.24
    d) 3.5

Q2. Attempt any FOUR   **(04 X 05 marks= 20 marks)**

1. Briefly explain the functions of subgrade.
2. Define resilient modulus, resilient strain and resilient deformation.
3. Explain importance of aggregate shape factor in bituminous mix design.
4. Explain briefly about term ageing of bitumen.

5. Determine Specific Gravity of Combined Aggregate in bituminous mix having, maximum theoretical specific gravity of 2.4. The bitumen content is 11% by weight of mix & its specific gravity is 1.2.
6. Differentiate between Marshall stability test and Super-pave technology.

Q3. Attempt any TWO   **(02 X 10 marks= 20 marks)**

1. The results of Marshall test for specimen is given below. Find optimum bitumen content of the mix.

Bitumen Content	Stability (Kg)	Flow (units)	Vv (%)	VFB	Gm
3	450	9.0	12.5	32	2.17
4	707	9.7	7.0	55	2.21
5	810	12.5	2.9	76	2.26
6	750	15.0	2.2	85	2.23
7	640	19.2	1.6	91	2.15

2. State the principle of CBR test. Write standard specifications followed for preparation of soil sample and testing.
3. According to AASHTO guidelines apply necessary corrections to the K-value based on following plate load test data:
   Dia. Of plate = 50cm

Take correction factor for lesser dia. of plate as 1.5 and correction factor for saturation as 0.82.

Pressure (kg/cm^2)	Settlement (cm)
0.70	0.026
1.40	0.067
1.75	0.085