

Roll No



**PRESIDENCY UNIVERSITY
BENGALURU**

SET-A

**SCHOOL OF ENGINEERING
END TERM EXAMINATION – MAY/JUNE 2024**

Semester : Semester VIII - 2020

Course Code : CIV2024

Course Name : - Pavement Materials and Construction

Program : B. Tech. Civil Engineering

Date : May 31, 2024

Time : 1:00 PM - 4:00 PM

Max Marks : 100

Weightage : 50%

Instructions:

- (i) Read all questions carefully and answer accordingly.
- (ii) Question paper consists of 3 parts.
- (iii) Scientific and non-programmable calculator are permitted.
- (iv) Do not write any information on the question paper other than Roll Number.

PART A

Answer any 10 Questions

10*2=20M

1. List the various grades of OPC available in the market for the production of concrete. (CO1) [Knowledge]
2. List the types of cement as per Indian Standards. (CO1) [Knowledge]
3. Outline the chemical composition of ordinary Portland cement. (CO1) [Knowledge]
4. List the desirable properties of aggregates as a pavement material. (CO1) [Knowledge]
5. List the types of binders used in the construction of flexible pavement. (CO2) [Knowledge]
6. Outline the modes of failure of flexible pavement. (CO2) [Knowledge]
7. List any four types of adhesion test conducted on bitumen. (CO2) [Knowledge]
8. Distinguish between bitumen and tar. (CO2) [Knowledge]
9. Indicate any six types of recycled materials used in road construction. (CO3) [Knowledge]
10. Outline the physical property tests conducted on geosynthetics before its application. (CO3) [Knowledge]
11. Mention the types of Geosynthetic materials used in road construction. (CO3) [Knowledge]

12. Mention any four advantages of using geosynthetics in road construction. (CO3) [Knowledge]
13. Earth-moving equipment includes various heavy machinery used for construction and earthworks. List any four earth moving equipments used in road construction. (CO4) [Knowledge]
14. Soil stabilization is required to upgrade the low cost roads to higher specification without involving appreciable wastage & the construction cost. List any four soil stabilization methods. (CO4) [Knowledge]

PART B

Answer any 10 Questions

10*4=40M

15. The Atterberg limits are a basic measure of the critical water contents of a fine-grained soil such as; shrinkage limit, plastic limit, and liquid limit. Define all the three atterberg limits. (CO1) [Comprehension]
16. Field test on cement is a basic need to check the quality of cement on construction site at the time of initial inspection to have an idea about the quality of cement. Discuss the various field tests conducted on cements. (CO1) [Comprehension]
17. The supporting soil beneath pavement and it's special under courses is called sub grade. Undisturbed soil beneath the pavement is called as natural subgrade. Compacted sub grade is the soil compacted by controlled movement of heavy compactors to achieve certain engineering properties of soil. List the desirable properties of soil as a pavement material. (CO1) [Comprehension]
18. Due to the movement of vehicles on the road, the aggregates are subjected to crushing and impact, resulting in their breaking down into smaller pieces. Discuss the necessity of determining aggregate crushing and impact values in pavement construction. (CO1) [Comprehension]
19. Various laboratory tests on bitumen is conducted to check quality and different properties of bitumen for pavement construction. Briefly explain the laboratory test conducted for grading of bitumen. (CO2) [Comprehension]
20. Tar is a dark brown or black viscous liquid of hydrocarbons and free carbon, obtained from a wide variety of organic materials through destructive distillation. Tar can be produced from coal, wood, petroleum, or peat. Discuss the classification of Tar. (CO2) [Comprehension]
21. Bitumen is the residue or by-product when the crude petroleum is refined. A wide variety of refinery processes, such as the straight distillation process, solvent extraction process etc. may be used to produce bitumen of different consistency and other desirable properties. Outline the requirements of bitumen in the pavement construction. (CO2) [Comprehension]
22. Studies of the physio chemical properties of the binder/ stone/ water system have so far not proved sufficient conclusion to develop a rational approach of testing the materials. This has led to develop arbitrary tests which may be used to examine the various combinations of road stones and binder used in bituminous road construction. Briefly explain the dynamic immersion test to determine the adhesivity of bitumen to road aggregates. (CO2) [Comprehension]
23. Geosynthetics are artificial synthetic materials made of polymeric or natural materials in the form of strips, a sheet, or a three-dimensional structure. Outline the classification of geosynthetics. Explain the applications of geosynthetics. (CO3) [Comprehension]

24. Using waste materials in road construction is an innovative approach that can address environmental concerns while improving road performance. Explain the use of crumb rubber in road construction.
(CO3) [Comprehension]
25. Using waste materials in road construction is an innovative approach that can address environmental concerns while improving road performance. Explain the use of reclaimed asphalt pavement in road construction.
(CO3) [Comprehension]
26. Using waste materials in road construction is an innovative approach that can address environmental concerns while improving road performance. Explain the use of Coal combustion products in road construction.
(CO3) [Comprehension]
27. Describe briefly soil-lime stabilization method to improve subgrade quality.
(CO4) [Comprehension]
28. Correctly proportional materials when adequately compacted to get a mechanically stable layer, the method is called mechanical stabilization. Explain the construction procedure involved in mechanical stabilization of soil subgrade.
(CO4) [Comprehension]

PART C

Answer any 4 Questions

4*10=40M

29. Concrete develops strength when the compounds of cement interact with water and produce C-S-H gel which is a binding material that hold aggregate particles together. Some of these reactions also liberate energy in the form of heat. Write a short note on (i) Hydration of cement and (ii) Heat of hydration
(CO1) [Application]
30. Various laboratory tests on bitumen is conducted to check quality and different properties of bitumen for pavement construction. Briefly explain the laboratory test conducted to determine the ductility of bitumen.
(CO2) [Application]
31. Several experimental and research studies have been dedicated to investigating potential incorporating of waste materials in road construction field. Many pieces of research have proven a success in reusing and recycling of some compositions of these waste materials in pavement structures and others are still undergoing comprehensive research studies to further shed the light on what can be gained from their recycling into pavement constructions. Briefly explain the use of plastics in road construction.
(CO3) [Application]
32. Several experimental and research studies have been dedicated to investigating potential incorporating of waste materials in road construction field. Many pieces of research have proven a success in reusing and recycling of some compositions of these waste materials in pavement structures and others are still undergoing comprehensive research studies to further shed the light on what can be gained from their recycling into pavement constructions. Describe the use of recycled asphalt shingles in road construction.
(CO3) [Application]
33. Correctly proportional materials when adequately compacted to get a mechanically stable layer, the method is called mechanical stabilization. Explain the following aspects related to mechanical stabilization of soil subgrade (a) Principle and applications (b) Factors affecting mechanical stability (c) Mix design and (d) Construction steps.
(CO4) [Application]

- 34.** To achieve high-quality subgrade, proper understanding of soil properties, proper grading practices, and quality control testing are required. However, pavement design requirements and the level of engineering effort should be consistent with relative importance, size, and cost of design projects. Describe the quality control tests for embankment and subgrade construction.

(CO4) [Application]