

Please check that this question paper contains 9 questions and 2 printed pages within first ten minutes.

[Total No. of Questions: 09]

[Total No. of Pages: 02]

Uni. Roll No.

Program: B.Tech. (Batch 2018 onward)

Semester: 4th

Name of Subject: Material Testing and Evaluation.

Subject Code: PCCE-106.

Paper ID: 16177.

Scientific calculator is Allowed

Time Allowed: 03 Hours

Max. Marks: 60

NOTE:

- 1) Parts A and B are compulsory
- 2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice
- 3) Any missing data may be assumed appropriately

Part – A

[Marks: 02 each]

Q1.

- a) Differentiate strength and stiffness. Illustrate the concept using suitable example.
- b) Non-structural materials should have low density and high thermal insulation whereas structural materials should be strong as well as tough. Give reason.
- c) Enlist factors affecting durability.
- d) Which zone is the weakest zone in micro-structure of concrete and why?
- e) Explain usage of Geogrid.
- f) Distinguish between Elasto-Plastic and Plastic response of material by taking relevant example.

Part – B

[Marks: 04 each]

- Q2.** Write a short note on crushing value and impact value of aggregates. What are their acceptable values for permitting use of aggregates in concrete construction?
- Q3.** Identify how can you reduce the effects of creep and shrinkage being exhibited by materials? Enlist different influential factors that control these two material properties.
- Q4.** Examine different influencing factors causing the fatigue failure and how they can be controlled.
- Q5.** The test results from a group of 4 non-overlapping consecutive test results (in MPa) are 21.75, 23.75, 19.8, 22.5. If the design concrete grade is M20, can we accept the concrete lot for construction.

- Q6. The highest magnitude of vertical load applied to the concrete block of size 150mm is 750 kN. The displacement caused was 4 mm. Calculate the stiffness of concrete. And, check whether the concrete if subjected to that much loading will be crushed or not, if the compression strength of the concrete is 25 MPa.
- Q7. Differentiate strain-softening and strain-hardening response exhibited by materials. Explain in detail with the help of appropriate example.

Part – C

[Marks: 12 each]

- Q8. (a) Explain in detail the various sections of a research report. (8)
(b) Discuss characteristic strength of material and why engineers prefer this strength in the design. (4)

OR

A 150 mm concrete cube is cast using M30 concrete. It is water cured for 7 days and then left for air curing. At the age of 28 days, it is placed under a compressive force of 50 kN for many days. Determine the change in the dimensions of the cube that will occur at 90 days from the casting date. The RH during these days can be taken as 50%.

- Q9. A set of concrete cubes was tested and their compressive strength (MPa) at 28 d is given below:
{24,27,26,21,28,29,31,26,27,28,24,21,24.5,25.5,26.5,30,32,26,23,24,26,28,29,22, 21,25,27,29,28,29} Analyse whether we can accept the quality of the concrete used for this construction project if its design compressive strength taken in the structural design calculation is M25.

OR

A concrete cube (150 mm) sample was tested in compression on a strain-controlled machine. The test data is given below:

Displacement, mm	LOAD, KN
0	0
0.25	18.1
0.75	23
1.25	25.5
2.5	21.2
3.75	7.3

Calculate the compressive strength of the concrete sample; its modulus of elasticity and resilience.
