Library

00016

CINEC CAMPUS
Beyond A Graduate

Faculty of Engineering & Technology

BSc (Hons) in Engineering in Civil Engineering

CE2323 Structural Design I

Module Leader: Mr. Venuka Kuruwita Arachchi

Academic Year 2022/2023

Re-sit Examination

Total time allocated 3 hours.

INSTRUCTIONS TO CANDIDATES

This paper contains 3 questions on 6 pages.

Answer all the questions.

This is an open book and open notes examination. Candidates are permitted to refer hard copies of Eurocode, National Annexes, and lecture notes only during the examination.

The respective details are provided in the appendix attached to the paper at the end.

The total maximum mark obtainable is 100. The marks assigned for each question and parts thereof are indicated in each question. Note that the questions do not carry equal marks.

If you have any doubt as to the interpretation of the wordings of a question, make your own decision, but clearly state it on the answer script.

Assume reasonable values for any data not given in or provided with the question paper, clearly state such assumptions made in the answer script.

You may use sketches in providing answers for the descriptive question

Question 01 (30 marks)

Figures 1 and 2 represent the building layout and the reinforcement arrangement of beam respectively. Assume that B1 is a simply supported beam. The cross section of it is shown in Figure 2.

Take unit weight of concrete as 25 kN/m^3.

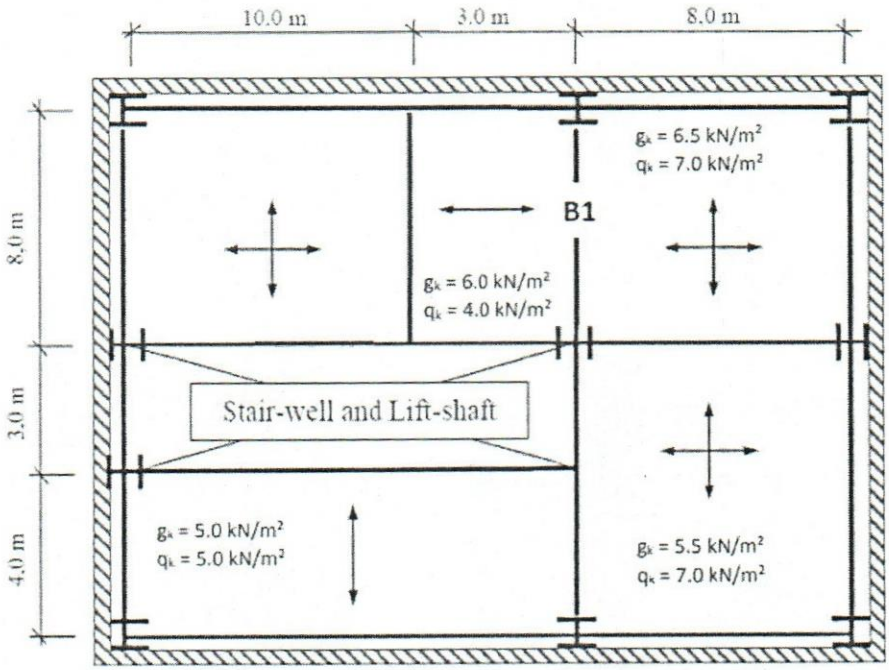


Figure 1. Building layout.

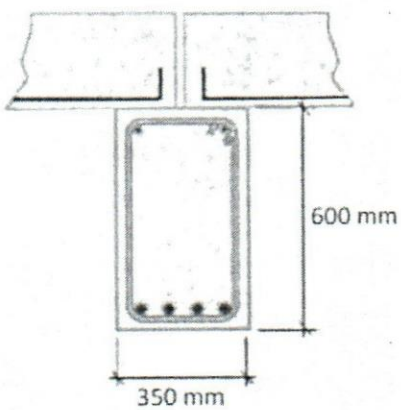


Figure 2. Cross Section and Reinforcement arrangement

a) Determine the end reaction and the ultimate bending moment at the mid span of the beam (g_k includes the self-weight of slab and beam) (7 marks)

b) Determine the main reinforcement requirement and provide main reinforcement requirement (take cover as 40 mm) (9 marks)

c) Verify the adequacy of the main reinforcement provided with the minimum and the maximum steel area to be maintained (4 marks)

d) Check the adequacy of the beam with respect to the deflection (10 marks)

Question 02 (30 marks)

A pad foundation is required to be designed for a column size of 450 mm x 450 mm. The proposed section view is presented in Figure 3. The footing is expected to carry an permanent load of 1200 kN and imposed load of 550 kN.

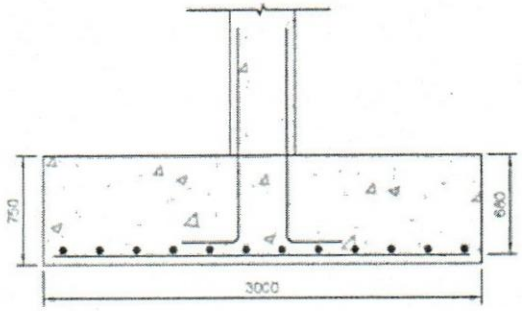


Figure 3. Proposed section view

Consider that, there is a moment of 250 kNm (permanent) and 200 kNm (imposed).

Note: f_{ck} = 40 N/mm^2, f_{yk} = 460 N/mm^2 and Bearing capacity = 200 N/mm^2

a) Determine the size of pad footing at serviceability limit state and verify. (08 marks)

b) Verify the shear resistance of the pad footing. (06 marks)

c) Check for the punching shear at 2.0d from the column face. (08 marks)

d) Verify the bending check of the pad footing and determine the minimum reinforcement requirement. (08 marks)

Question 03 (40 marks)

Figures 4 and 5 show the plan and elevation views of loaded industrial structure consists with three floors. The characteristic material strengths are f_{ck} = 25 N/mm^2, f_{yk} = 500 N/mm^2 and basic span-effective depth ratio = 19 for a stressed slab for class C25/30 concrete and ρ = 0.5%.

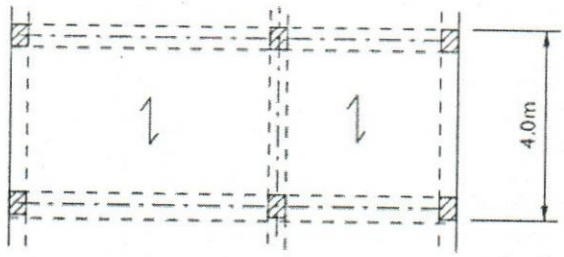


Figure 1. Plan view of the structure

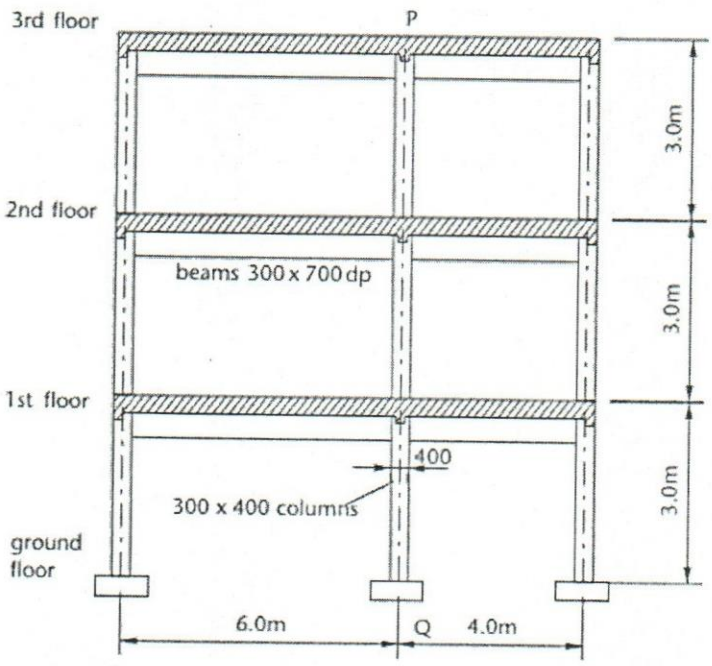


Figure 2. Elevation of the structure

The frames at 4 m centers, are braced against lateral forces and supported the following floor loads.

Permanent action g_k = 10 kN/m^2

Variable action q_k = 15 kN/m^2

a) Design a simply supported slab by:

i. Verifying the span-effective depth ratio (5 marks)

ii. Verifying the shear (5 marks)

iii. Verifying the bending reinforcement (5 marks)

iv. Providing the steel distribution details (5 marks)

b) Assuming that the effective height of the ground floor column to be 2.34 m and that of the first and second floor columns to be 1.80 m,

i. Determine the ultimate load at each floor (5 marks)

ii. Determine the column moments (5 marks)

iii. Verify the design moments of the columns (5 marks)

iv. Provide the column reinforcement details (5 marks)

-END OF PAPER-

CINEC CAMPUS
Beyond A Graduate

Faculty of Engineering & Technology

Department of Civil Engineering

Bachelor of Science Honours in Engineering

Year 1 Semester 1 In-Class Examination 2023

Module Code	:	CE1313
Module Title	:	Properties of Materials
Date/Time	:	19th January 2023 / 01.30 pm – 02.30 pm
Examiner	:	P.W Gavithra Udayakumara
Time Allowed	:	One hour

INSTRUCTIONS TO CANDIDATES

- This is a **closed book** examination.
- You should attempt **ALL** questions.
- Show all stages of your work.
- This paper contains 4 pages.
- **Attempt all 05 questions.**
- **One hour will be allocated to answer all the 05 questions.**

MATERIALS REQURIED

- Answer Booklet.
- You may use a scientific calculator. This must not be programmable and may be inspected during the examination.
- Extra answer papers (if required)
- Equations are mentioned at the 4th page

Student Number .....

1. A relatively large plate of glass is subjected to a tensile stress of 70MPa. If the specific surface energy and modulus of elasticity for this glass are 0.6J/m^(2) and 88Gpa, respectively, determine the maximum length of a surface flaw that is possible without fracture.

2. Estimate the theoretical fracture strength of a brittle material if it is known that fracture occurs by propagation of an elliptically shaped surface crack length of .8mm and having a tip radius of curvature of 7 *10 ^(-3) mm when a stress of 1080MPa is applied.

3. Below mentioned the details of a bridge to happen a failure with respect to the type of moving vehicles

Type of vehicle s_i (MPa)	No. Applied Cycles by 1 vehicle, N_i	Number of vehicles moving on the bridge	No. Cycles to Failure, N_{fi}
Prime mover	500	X	10,000
bus	50	5	500
car	40	2	320

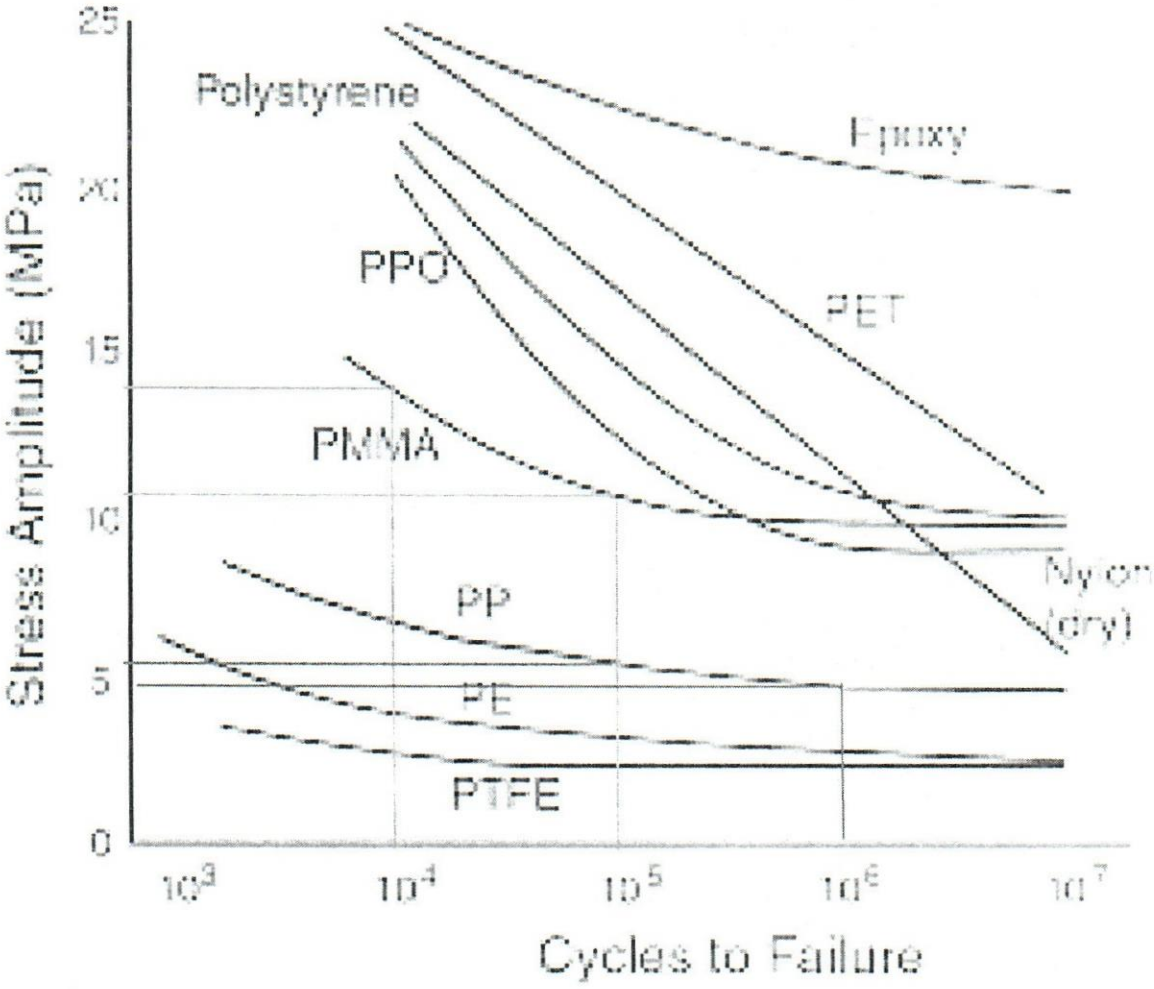
What will be the minimum number of prime movers(X) that can be moved to fail the bridge?

4. Below figure shows the fatigue test for 9 different type of commonly using thermoplastics in industry. By using the fatigue cycling formula calculate the following.

a. Determine the "constant representing the structural detail" and the "Slope coefficient of mean test result line" by using the data given below with reference to the given graph

PP $\{(10^5, 6), (10^6, 5)\}$
PMMA $\{(10^4, 14), (10^5, 11)\}$

b. Determine the endurance limit for above two
c. Compare the results and give a brief description on each



5. Define the term "Fatigue Failure" and mention 3 factors affecting "fatigue life" with one example for each factor

$$\sigma_c = \left(\frac{2E\gamma_s}{\pi a} \right)^{1/2}$$

$$\sigma_m = 2\sigma_0 (a/p_t)^{1/2}$$

$$\Sigma n_i / N_{fi} \leq 1$$

$$N(S_a)^m = c$$

Faculty of Engineering & Technology

Bachelor of Science Honours in Engineering in Civil Engineering

CE4321 – Construction Engineering & Management

Final Examination

Module Leader	**: Mr. Umesh Krishantha**
Academic Year	**: 2023**
Date	**: 29th March 2023**
Time	**: 1330 - 1630 hours**
Type	**: Closed Book**

Instructions to Candidates:

- This paper consists of four (05) questions. Answer **any five (07)** questions.
- All questions carry equal marks.
- Use only A4 size paper and graph paper for your answers.
- Write clearly and legibly with a blue or black pen.
- Write your name and student number on all sheets.
- Answers to different parts of the same question (other than any graph sheets used) should not be scattered.
- You are advised to make a clear diagram for each question, where appropriate.

Q1.

Assume that you have been assigned as an independent consultant for a construction project to review a project plan and hand over the following information which was prepared by the project engineer.

Table 1 : Project Activity Sheet

Activity	Predecessor	Time Estimation (Weeks)		
		Most Optimistic	Most Likely	Most Pessimistic
		(a)	(b)	(c)
A	None	9	12	15
B	A	8	9	13
C	A	4	6	8
D	B	12	18	21
E	C,D	11	15	18

1. Draw the PERT network for the project. (04 Marks)
2. Prepare the activity schedule for the project and determine the critical path. (06 Marks)
3. What is the level of volatility time (Variance) required from the average time to complete this project? (05 Marks)
4. You have been informed that the project has to be completed within 48- weeks by your employer. Determine the probability (Z) that the project will be finished within the time limit. (05 Marks)

Q2

1. Emphasize the nature of goals and objectives organization can achieve using a Project instead of Day-to-day operations, since the concept of "Project" was developed to achieve specific organizational objectives and goals while the same organization is achieving objectives and goals via their day-to-day operations as well. (03 Marks)

2. Consider yourself as a project manager of such organization. The top management has decided to improve their organizational state by using project approach. Describe the process you have to implement in order to achieve given objectives and goals. (05 Marks)

3. Assuming that you are a project manager for a construction company, expected to provide the best outcome possible, so that company investment on the project would provide the maximum Return on Investment. 03 areas in project management competent stream are considered to be the pilar of project management. Clarify your approach to provide max ROI for the company using the (03) pillar concept. (12 Marks)

Q3.

You have been assigned as a planning engineer for a construction project undertaken by a well-known construction company. The project is situated in an urban area and has a 20 week time period to complete. Following gantt chart shows the activity schedule for the said project.

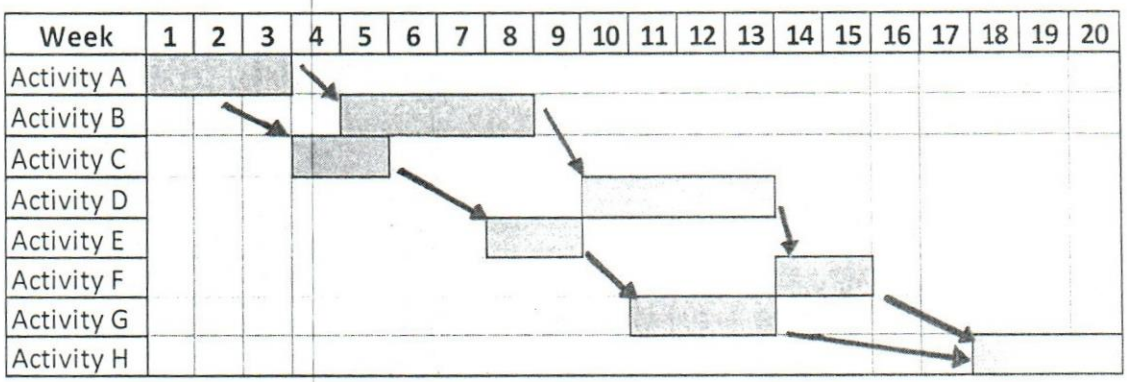


Figure 1 : Gantt Chart for the Project

1. Calculate Total float & free float of each activity of the project. (06 Marks)
2. Determine the critical path & explain reasons for your decision (06 Marks)
3. Assume that Duration of Activity B has been reduced to 03 week and Activity E has been increased to 03 weeks due to unavoidable reasons. Clearly explain changes that would occur to the above work schedule. (08 Marks)

Q4.

1. "Quality is beyond what project specification says about the final outcome". Rationally evaluate the statement. (05 Marks)

2. Quality Management Systems (QMS) are being widely used around the globe in almost every industry as a standard instead of quality assurance or quality control methodologies. Explain why such standard to be advantages to adopted to any organization.(05 Marks)

3. Setting of control points in the project management system controlling process is one of main methods used widely in the construction industry aiming such outputs. Explain one of widely used method of control points to maintenance the expected and agreed quality of a construction project. Discuss the usage of this method in construction projects where applicable using practical applications. (10 Marks)

Q5.

1. "Mobilization is a project before the project". Are you agree with this statement? Elaborate your answer. (04 Marks)

2. Construction project mobilization is considered to be one of most important & critical activities, which might affect the project negatively if not done properly. Explain 04 major steps of mobilization process with practical examples. (06 Marks)

3. Consider yourself as mobilization officer working for a road construction company. You are being assign to a construction project of a road in Gampaha district rural area. (10 Marks)
   a. Clearly list out activities you have to carry out for this mobilization
   b. Briefly explain your requirements (Machinery, human or financial) if any for the work.
   c. Clearly describe your assumptions made for above answers
   d. Develop the mobilization plan

Q6

The table shown below is a part of work plan for construction of two (02) story house.

Table 2 : Construction Work Plan

WBS	Task Name	Duration	Start	Finish	Predecessors
1	Foundation				
1.1	Excavation for finish ground level	7 days	Feb 16 '22	Feb 24 '22	
1.2	Completion of base & Columns	21 days	Feb 24 '22	Mar 20 '22	2
1.3	Completion of Tie beams	14 days	Mar 20 '22	Apr 5 '22	3
2	Superstructure				
2.1	Columns in ground floor	15 days	Apr 6 '22	Apr 23 '22	4
2.2	Beams & Slab	21 days	Apr 27 '22	May 21 '22	6FS+3 days
2.3	Wall construction at ground floor	14 days	Jun 15 '22	Jul 1 '22	7FS+21 days
2.4	Columns in 01st floor	15 days	May 25 '22	Jun 11 '22	7FS+3 days
2.5	Wall construction at first floor	14 days	Jun 11 '22	Jun 27 '22	7,9
3	Roof				
3.1	Roof structure	10 days	Jun 27 '22	Jul 9 '22	10
3.2	Roof covering	6 days	Jul 9 '22	Jul 16 '22	12
4	Wall finishing				
4.1	Completion of wall plastering	40 days	Jul 1 '22	Aug 16 '22	8
4.2	Applying of wall putty	30 days	Jul 18 '22	Aug 22 '22	15FF+5 days
4.3	Painting	8 days	Sep 5 '22	Sep 15 '22	21
5	Floor finishing				
5.1	Ground floor concreting	4 days	May 21 '22	May 26 '22	7
5.2	Bedding and tiling for Ground floor	6 days	Aug 22 '22	Aug 29 '22	16
5.3	Bedding & tiling for First floor	6 days	Aug 29 '22	Sep 5 '22	20
6	Roof finishing				
6.1	Fixing of ceiling	20 days	Aug 22 '22	Sep 15 '22	16,13

6.2	Completion of gutters & down pipes	8 days	Sep 15 '22	Sep 24 '22	23

1. Develop the Gantt chart for above work plan and clearly show the critical path. (06 Marks)
2. Represent the Duration S-curve for your Gantt chart (06 Marks)
3. Discuss the use of main three (03) project controlling methods with relevant graphs and important factors. (08 Marks)

Q7

1. Transparency is a major quality every manager has to acquire, while working with procurement related matters. As a project manager working in a construction project, you would have to work with various subcontractors and suppliers to fulfil planned tasks. Briefly describe the method you would use as a project manager to gain the transparency. (08 marks)

2. XYZ industries (Private) Limited is a company that operates in the logistic management industry. With the high demand market and higher profit margins, they are planning to diversify by investing in a shopping mall with their own funds for lease out. You have been hired as a consultant to evaluate the concept. Select & justify the best tendering method to select a company to carry out the project. (12 Marks)

-End of Questions-

CINEC CAMPUS
Beyond A Graduate

Faculty of Engineering & Technology

Department of Civil Engineering

Bachelor of Science Honours in Engineering

Year 1 Semester 1 Final Examination 2023

Module Code	:	**CE1313**
Module Title	:	**Properties of Materials**
Date/Time	:	**15th February 2023 / 09.00 am – 12.00 am**
Examiner	:	**P.W Gavithra Udayakumara**
Time Allowed	:	**Three hours only**

INSTRUCTIONS TO CANDIDATES

- This is a **closed book** examination.
- "Section A" consists of 10 Multiple Choice Questions. You should attempt **ALL** questions.
- Section B consists of 5 questions. You should attempt only 4 questions.
- Show all stages of your work.
- This paper contains 10 pages.

MATERIALS REQURIED

- Answer Booklet.
- You may use a scientific calculator. This must not be programmable and may be inspected during the examination.
- Extra answer papers (if required)
- Equations are mentioned at the 9th page

Student Number .....

SECTION A

1. Which of the following is true when a continuous fiber reinforced composite is loaded perpendicular to the fibers?
   (a) l be fiber phase lakes up most of the load.
   (b) The stress is distributed evenly between the fibers and the matrix phases.
   (c) The fiber and matrix phases are under isostrain conditions.
   (d)The modulus of the composite follows the "rule of mixture" with the volume fracture of fiber

2. What is the false statement about the "forming" operation
   a) The shape of metal piece is changed by plastic deformation.
   b) Increase the strength with decrease in ductility by cold working
   c) Energy requirement is relatively less in hot working method
   d) Deformation achieves at a temperature below that at which the recrystallization occurs in hot working method

3. Which of the following statement is true?
   a) The electrical conductivity is directly proportional to both the number of free electrons and the electron mobility.
   b) The electrical conductivity is inversely proportional to both the number of free electrons and the electron mobility.
   c) The electrical conductivity is directly proportional to the number of free electrons but inversely proportional to the electron mobility.
   d) The electrical conductivity is inversely proportional to the number of free electrons but directly proportional to the electron mobility

4. Compute the percent cold work resulting from the reducing of cylindrical copper rod from 15.2mm to 12.2mm
   a) 35.6%
   b) 36.5%
   c) 64.4%
   d) None of the above

5. Tensile testing apparatus constructed to withstand a maximum load of 220,00N. Design has two supports, each carry half of the maximum load. The base plate and the two supports have been manufactured with alloys having 310MPa and 565MPa tensile strengths respectively. Specify the suitable diameter for these support posts. Assume the safety factor as 5.
   a) 47.5mm
   b) 62.3mm
   c) 24.8mm
   d) 34.7mm

6. Consider two bars A and B of same material tightly secured between two unyielding walls. Coefficient of thermal expansion of bar A is more than that of B. What are the stresses induced on increasing the temperature?
   a) No stress will develop due to equally building up the compression and tension stresses
   b) Tension in material A and compression in material B
   c) Compression in material A and tension in material B
   d) Compression in both the materials

7. Which of the following is true about ductile to brittle transition (DBT) temperature?
   (a) DBT temperature is not an imported consideration in materials selection forcomponents that operate in low temperature environments.
   (b) In BCC metals like steel, a slow (gradual) change in behavior is observed over a narrow range of temperature.
   (c) Above DBT temperature, a metal will absorb high amount of energy before fracturing.
   (d) Below DBT temperature, a metal will fail is a ductile manner

8. Continuous and aligned glass fiber-reinforced composite of 40 vol% of glass fibers having a modulus of elasticity of 69GPa and 60 vol% of a polyester resin that when hardened, displays a modulus of 3.4 GPa. Compute the modulus of composite if the stress is applied perpendicular ti the direction of fiber alignment
   a) 4.3GPa
   b) 5.5GPa
   c) 6.7GPa
   d) 8.2GPa

9. Which of the following is true regarding n-type extrinsic semi-conductors?
   (a) There is an equal number of electrons and holes.
   (b) There is a donor energy level just below the conduction band.
   (c) n type extrinsic semiconductors generally have a lower conductivity thanintrinsic semiconductors since they only have one type of charge carrier.
   (d) n-type extrinsic semiconductors are doped with atoms with a valency of 3.

10. Isotropic materials are those which have the same
    a) Thermal properties in all direction
    b) Electric and magnetic properties in all directions.
    c) Stresses induced in all directions
    d) Elastic properties in all directions

SECTION B

Question 01

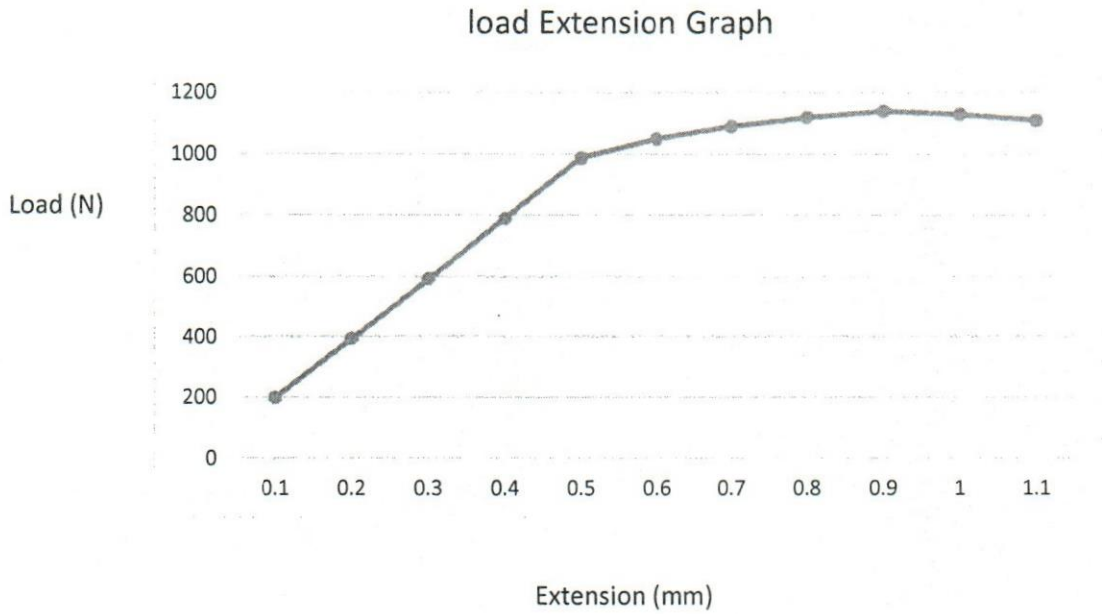
Composites can be defined as a material consisted with customized properties to meet the prevailing requirement of the various engineering disciplines. Cost effectiveness, improved stiffness and oxidation resistance are some of those improved characteristics. Assume you have been allocated for research and development team in manufacturing "continuous and aligned glass - fiber reinforced plastic" with optimized mechanical properties. As per the obtained results, the composite consists of 35% glass- fibers and the remaining portion with plastic matrix. The elastic moduli of glass fiber and plastic are 80GPa and 15GPa. Respective tensile strengths are 2300MPa and 200MPa. If the composite subjected to a load of 32,000N parallel to the fibers and having the cross sectional area of 500mm^2, answer the following questions.

a) Briefly explain how "rule of mixture" theory can be used to ensure the applicability of new product with the aid of graph. (Upper bound and lower bound graphs can be assumed by yourself)
b) The modulus of elasticity of this composite in the longitudinal direction.
c) The fiber-matrix load ratio.
d) Strain experienced by the matrix.
e) Name 3 types of polymer matrix composites and mention 2 applications for each of those.

Question 02

Strength of materials recommends as one of the critical engineering properties to be concerned during the designing purposes. Tensile test reveals some important parameters with regarding to the strength of the materials.

a) Mention the process of calculating the tensile strength of brittle materials with the aid of sketch and respective equation.
b) Tensile stress applies along the longitudinal direction of cylindrical shaped steel front axle of a motor car which is having the diameter of 60mm. If the maximum permissible diameter change of the axle is $9^* 10^{-3}$ mm, calculate the critical tensile strength that can be applied to the rod without being subjecting in to failure. Poisson's ratio for steel is 0.28 and modulus of elasticity is 200GPa.
c) Calculate the Yield stress, Ultimate tensile stress and the elastic modules of the material shown in the graph. {[0.1, 197.5], [0.2,395], [0.3, 592.5], [0.4, 790], [0.5,987.5], [0.6, 1050], [0.7,1090], [0.8, 1120], [0.9,1140], [1, 1130], [1.1,1110]}



d). Briefly explain the terms "True Stress" and "True strain".

e) A cylindrical rod having the initial diameter of 14.2 mm subjected to fracture by applying tensile load. Engineering strength at the fracture was 510MPa. If the cross sectional diameter at the fracture is 12.5mm, determine the true stress at the fracture.

Question 03

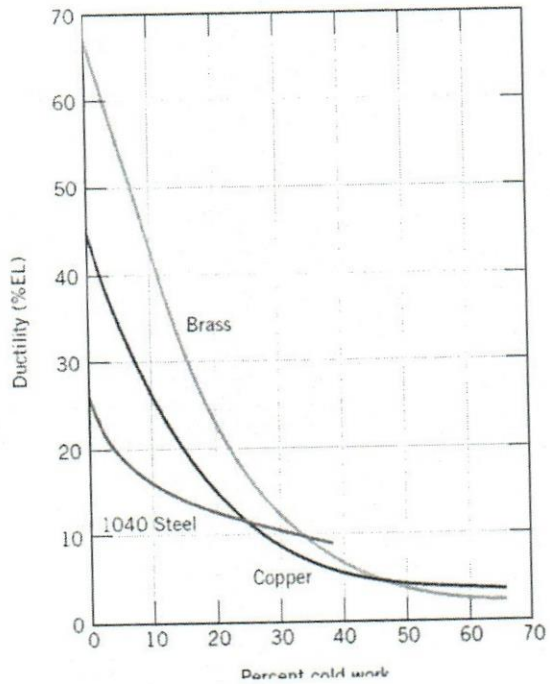
Electrical conductivity considers as one of the most important properties of a material. Based on the electrical conductivity materials can be categorized in to three groups as conductors, semiconductors and insulators. Out of these, Semiconductors apply in numerous engineering applications. Based on the properties of Semiconductors answer the following questions.

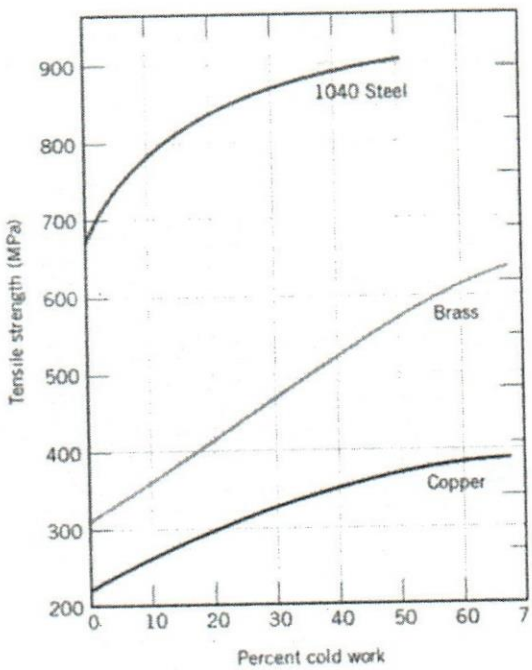
a) Draw the band structure of semiconductors and name the major carriers of intrinsic semiconductor
b) Name two types of extrinsic semiconductors and briefly explain those (Use diagrams if required)
c) For intrinsic silicon, the room-temperature electrical conductivity is $8 \times 10^{-4}\ \Omega^{-1}m^{-1}$. The electron and hole mobilities are, 0.24 and 0.064 m^2/Vs respectively. Compute the electron and hole concentrations
d) Name three factors on which the thermal resistivity of a material depend on and briefly explain one of those factors (how if affect to the conductivity)

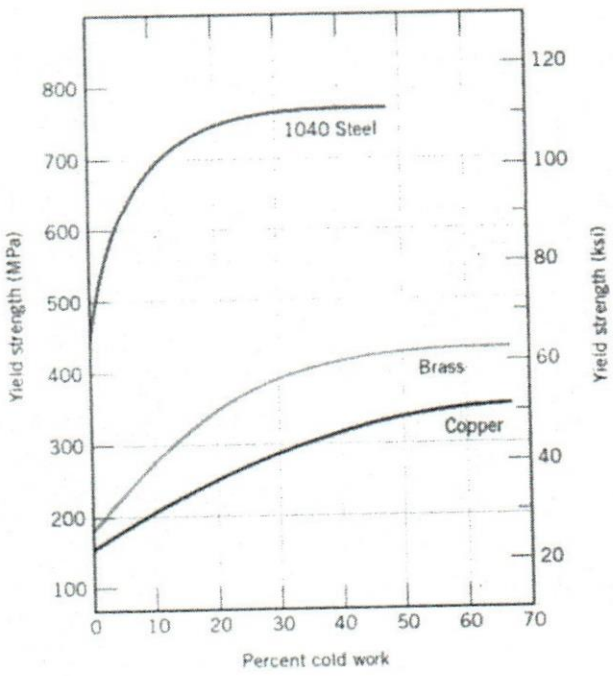
Question 04

Strain hardening defines as a scenario where a ductile metal becomes harder and stronger when it deforms plastically. This process also called as "Cold Working". Based on the strain hardening process, comment on the below process.

a) A Cylindrical rod of non cold-worked brass is having an initial diameter of 6.5 mm is to be cold work by drawing such that the cross- sectional area is reduced. It is required to have a cold- worked yield strength of at least 350 MPa and ductility in excess of 20% EL, in addition, a final diameter of 5.2 mm is necessary. Briefly describe the procedure with the aid of required calculations as well.







b) Briefly explain 3 types of cold work processing of metals with the help of diagrams.
c) Mention the three stages of annealing process with the aid of a diagram.
d) Briefly explain "Hypo- eutectoid" and "hyper-eutectoid" steels in annealing process. (Can use the diagram as well for the describing)

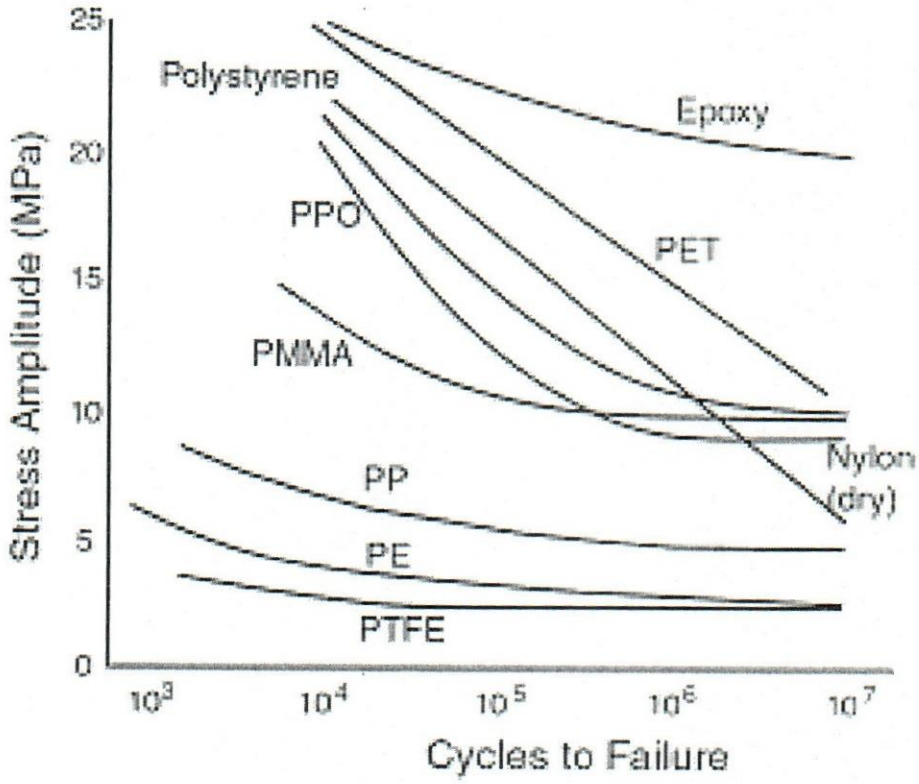
Question 05

Failures of material can be defined as an undesirable event occurs which lead to economic loss, loss of human lives and loss of time. Therefore it is essential to avoid the occurrence of failures in engineering products.

a) Determine the "constant representing the structural detail" and the "Slope coefficient of mean test result line" by using the data given below with reference to the given graph

PP $\{(10^5, 6), (10^6, 5)\}$
PMMA $\{(10^4, 14), (10^5, 11)\}$

b) Determine the endurance limit for above two

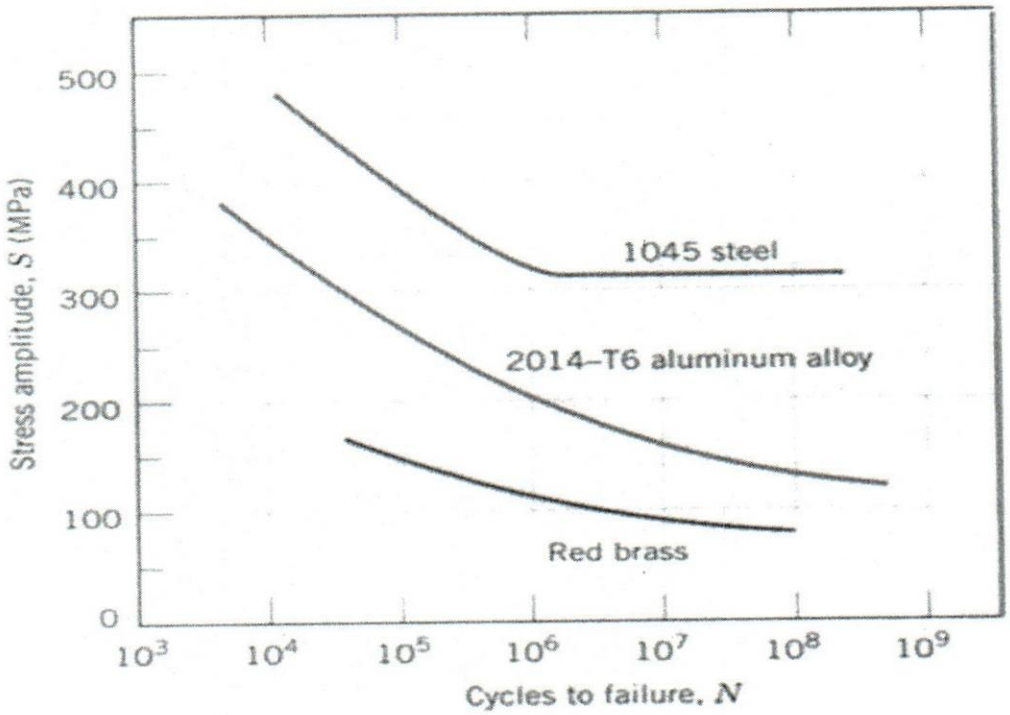


c) Assume you have entitled to engineering research team which finds the "root cause for recently failed bridge. Major concern is to determine whether the failure happened due to using of poor quality materials or due to failure of construction".

Comment on the way you propose to compare these two assumptions and how to evaluate the obtained results?

d) Recommend two methods to enhance the lifetime of a material against rupture failure.

e) For a bridge construction activity, a cylindrical shaped 1045 steels bars are using for reinforcement Structure which subjects to compression-tension stress cycling along the axes. If load amplitude is 240,000N, compute the minimum allowable bar diameter to ensure that the fatigue failure will not occur. Assume that the safety factor is 2



$\sigma = E\epsilon$

$\epsilon_A = \{(A_0 - A_f)/ A_0\} * 100\%$

$MOR = (3PL) / (2bd^2)$

$\%CW = \{ (A_0 - A_d)/A_0)\} * 100\%$

$\sigma_c = \{2E\gamma_s / \pi a\}^{1/2}$

$N(S_a)^m = C$

$P_{LM} = T [C + \log (tr)]$

$I = AneV_d$

$\sigma = n|e|\mu_e + p|e|\mu_h$

$E_c(u) = E_m V_m + E_p V_p$

$E_c(l) = E_m E_p / (E_m V_p + E_p V_m)$

$F_c = F_m + F_f$

$\sigma_c A_c = \sigma_m A_m + \sigma_f A_f$

$\sigma_c = \sigma_m V_m + \sigma_f V_f$

$\sigma_c/\epsilon_c = (\sigma_m/\epsilon_m) V_m + (\sigma_f/\epsilon_f) V_f$

$E_c = E_m V_m + E_f V_f$

$E_c = E_m (1-V_f) + E_f V_f$

Faculty of Engineering& Technology

Bachelor of Science Honours in Engineering in Civil Engineering

Construction Materials CE2316 Module

Leader: Mr.Gavithra Udayakumara

Academic Year 2022

Friday, 10th February 2023 from 01:30 pm to 03:30 pm

Re-Sit Mid- Semester Examination

Time Allocated 2 hours (120 minutes)

Note:

- Attempt **all** questions
- Closed book test, no mobile phones, iPads etc.
- Write your name and student number on any additional sheets

1. Workability of concrete directly proportional to [2 marks]
a) Aggregate cement ratio
b) Time to transit
c) Grading of the aggregate
d) Climatic condition of laying location
e) All of above

2. Select the correct statement. [2 marks]
a) Carbonation reaction in concrete can increase the deterioration of non-reinforced concrete.
b) Higher the value of Uniformity coefficient (Cu), more uniform the particle size distribution.
c) Lower the w/c ratio, lower the possibility of bleeding
d) The 28 days strength in concrete with retarders is generally lower than the 28 days strength in concrete without retarders
e) The maximum size of aggregate is one of the major factors that affects the strength of concrete.

3. Select the wrong statement. [2 marks]
a) If the temperature of the day on which concrete is being transported is predicted to be high, it is better to add retarders.
b) Accelerators always cause a noticeable increase in early strength development.
c) In the cube test, when casting the cube, concrete should be placed in the cube in 3 layers and each layer should be tamped 25 times.
d) Plasticizers in excess amount can decrease the workability.
e) When mixing concrete, for grade 30 and above the usual practice is to go for a design mix

4. Compared to original Portland cement, high alumina cement has [2 marks]
a) Higher initial setting time but lower final setting time
b) Lower initial setting time but higher final setting time
c) Higher initial and final setting time
d) Lower initial and final setting time
e) None of the above

5. Select the correct statement. [2 marks]
a) Carbonation reaction in concrete can increase the deterioration of non-reinforced concrete.
b) Higher the value of Uniformity coefficient (Cu), more uniform the particle size distribution.
c) Lower the w/c ratio, lower the possibility of bleeding
d) The 28 days strength in concrete with retarders is generally lower than the 28 days strength in concrete without retarders
e) The maximum size of aggregate is one of the major factors that affects the strength of concrete.

6. Name four main compounds in Portland cement and briefly describe reactivity of these compounds with water including the role of gypsum in relation to these [4 marks]

7. Briefly explain brittleness of bituminous materials with respect to the penetration value [2 marks]

8. "Aluminium can be used as a material for construction in civil engineering". Briefly justify this statement. [3 marks]

9. What is the major difference between iron making and steel making process [2 marks]

10. Briefly compare brittleness, setting time and melting point of hard and soft bituminous materials [3 marks]

11. Briefly explain how water cement ratio affects the strength of concrete [4 marks]

12. What is the best binder material to be used in construction of a road in an environment which undergoes frequent temperature changes [2 marks]

13. Fill the blanks by selecting the correct word from the dropdown list (10 marks)

Water cement ratio is the factor that largely determines the strength of __[1]_____concrete and workability of __[2]_____ concrete. The water is needed for _____[3]____reactions which will give the _____[4]____ to the hardened concrete. The However, at _____[5]____, the strength of concrete will be lower, due to higher air voids. And _____[6]____ the w/c ratio, higher the workability. It is _____[7]____to compact concrete, if the workability is high. Proper compaction is also important to achieve good strength. Therefore, it is really important to achieve the optimum w/c ratio. W/C ratio is lowered by _____[8]____ the _____[9]____but never by _____[10]____ the _____[11]____.

Drop down list
(hardened; Fresh; cement hydration; strength; higher w/c ratio; higher; easier; lowering; water content; increasing; cement content; Curing; lower w/c ratio; durability; lower; difficult)