

INSTITUTE OF AERONAUTICAL ENGINEERING
(AUTONOMOUS)

Code No: **BST301**

MODEL QUESTION PAPER - I

M.Tech I Semester Regular Examinations, February 2017

MATERIAL SCIENCE

Structural Engineering

Time: 3 hours

Max. Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

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UNIT - I

- 1 (a) Explain mechanical properties with the help of bonding force and bonding energy curves. (4M)
- (b) How do you find the number of vacancies in a crystal with the help of Arrhenius relationship in a step by step process. (10M)
- 2 (a) Give the relationship of elastic deformation to the stretching of atomic bonds. (5M)
- (b) Give a short note on the six categories of engineering materials. (9M)

UNIT - II

- 3 (a) Explain the high stress and low stress alternatives for plastic deformation of a crystal explain each alternative in detail. (8M)
- (b) Find out the modulus of elasticity of a steel rod with the help of a stress strain curve. (6M)
- 4 (a) Write a short note on the big 4 properties which could be analyzed with the help of a graph produced from tensile test. (10M)
- (b) Write a detail note on toughness. (4M)

UNIT - III

- 5 (a) Write in detail on the theory of activation energy. (7M)
- (b) What are the applications of fcc and hcp alloys. (7M)
- 6 (a) How Arrhenius relationship contribution to creep explain it with the help of Arrhenius plot. (8M)
- (b) What is a Charpy tester why it is used and how it is used for testing of an engineering material. (6M)

UNIT - IV

- 7 (a) Explain Griffith crack in detail with the help of a design plot and give a detailed idea on the relationships in design plot. (10M)
- (b) Define fatigue in detail. (4M)
- 8 (a) What is the difference b/w a good fracture and bad fracture in fractured toughness with their practical application. (6M)
- (b) Write a short note on fatigue test and draw a typical fatigue curve and explain its relationship with strength. (8M)

UNIT - V

- 9 (a) Explain the tin-bismuth experiment with the help of a phase diagram. (5M)
(b) Draw A TTT relation diagram for a eutectoid steel. (9M)
- 10 (a) Write a detail note on diffusional and diffusionless transformation. (8M)
(b) Write a very detail note on intrinsic semi-conductor. (6M)

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MODEL QUESTION PAPER - II

M.Tech I Semester Regular Examinations, February 2017

MATERIAL SCIENCE

Structural Engineering

Time: 3 hours

Max. Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT - I

- 1 (a) How the defects in interstitial spaces be used to advantage in the manufacturing of steel explain in detail. (8M)
- (b) How point defects facilitate solid state diffusion and also state the fick's law. (6M)
- (OR)
- 2 (a) Explain arrihenious relationship and the equation with the help of a graph. (7M)
- (b) Define what do you mean by "structure leads to properties" explain in detail. (7M)

UNIT – II

- 3 (a) Explain the implementation of a high stress process for the creation of a plastic deformation of a perfect crystal? (10M)
- (b) Explain the stress strain curve with the help of a tensile test. (4M)
- (OR)
- 4 (a) Write a short note on edge dislocation of crystal (6M)
- (b) Have a brief note on with the help of graph
- i) Toughness [4m] ii) Ductility [4m]
- Determine the expression for the vertical deflection curve.

UNIT - III

- 5 (a) explain what do you understand by the term creep curve. (4M)
- (b) Why have liberty ships failed catastrophically what is the mechanism which was neglected and explain it in detail. (10M)

OR

- 6 (a) Explain dislocation climb in detail. (6M)
- (b) Explain the phenomenon of variation in ductile-brittle transition temperature with alloy composition. (8M)

UNIT - IV

- 7 (a) Explain the stress vs flaw size relationship in a structural material with the help of a design plot. (7M)
- (b) Compare the tensile strength curve with fatigue strength curve and list out the major differences with reasons for it. (7M)

OR

- 8 (a) Explain the mechanism by which crack growth can occur and lead to catastrophic failure. (7M)
(b) What is a critical flaw explain it in detail. (7M)

UNIT - V

- 9 (a) What is an eutectic and eutectoid reaction and the eutectic point explain it in detail and their application in steel industry. (8M)
(b) Write a detail note on extrinsic semi-conductor. (6M)

OR

- 10 (a) Explain the lead tin phase diagram (6M)
(b) Write a detail note on the combined intrinsic and extrinsic semi- conductorial behaviour (8M)