

University Institute of Engineering & Technology

(Recognised Under Section 2(f) and 12B of UGC)

Kurukshetra University, Kurukshetra

THEORY EXAMINATION – JULY 2021	
B.Tech. Mechanical Engineering	SEMESTER – IV

TIME – 4 Hrs.

M.M. - 75

PAPER - ES-204

SUBJECT- Materials Engineering

INSTRUCTIONS TO BE FOLLOWED

- The candidates will be required to attempt All questions in Part-A and Part-B (Compulsory Sections). Attempt any four questions from Part-C selecting at least one from each unit.
- Allotted time for examination is 4 hours that includes time for downloading the question paper, writing answers, scanning of answer sheets and uploading the sheets on the Attendance Sheet Cum Answer Sheet Uploading google form.
- The PDF files should be saved as Roll No. and Subject Code.
- Maximum Page Limit should be 36 (Thirty Six) for attempting the question paper on A4 sheets which could be downloaded and printed from the sample sheets given in the UIET Website.
- Over-attemptation should be avoided.
- Handwriting should be neat and clean and diagrams should be clear and contrasted.
- The candidate should not write their Mobile No. otherwise Unfair Means Case will be made.
- While attempting the paper, the candidate will use blue/black pen only.
- Before attempting the paper, the candidate will ensure that he/she has downloaded the correct question paper. No complaint for attempting wrong question paper by the candidate will be entertained.
- Candidate must ensure that he/she has put his/her signature on each page of the answer sheet used by him/her. Answer sheet without the signature of the candidate will not be evaluated.
- Attempt parts A, B & C separately. Do not inter-mix them. Write neatly & mention the question number clearly.

PART-A (15 Marks)

Q. No. – 1 Answer the following questions.

15x1=15

(i)	How many crystal systems and Bravais lattices are there in crystallography?
(ii)	List any three surface defects occurring in crystals.
(iii)	Differentiate between true and engineering stress.
(iv)	What is meant by yield point phenomenon?
(v)	Define the term Solid solution.
(vi)	What is a cooling curve?
(vii)	A stamped steel undergoes an annealing process. Average grain size before annealing was 1.5 μm . Another soft ferrous material of average grain size 14 μm undergoes hardening process. What will be the effect of both processes on increase or decrease of respective grain size of both samples?
(viii)	List various surface hardening methods.
(ix)	Differentiate between fatigue and creep.
(x)	List three stages of fatigue failure.
(xi)	Define the terms fatigue strength and fatigue limit.
(xii)	Which microscope offers highest magnification levels out of SEM, TEM and STM.
(xiii)	Illustrate the meaning of term inter-granular fracturing.
(xiv)	Why electrons are used instead of light in a scanning electron microscope?
(xv)	What is the highest resolution level achieved in TEM?

PART-B (20 Marks)

UNIT-I		
2	Discuss the significance of atomic packing factor in crystallography. Calculate atomic packing factor for BCC crystal.	5
UNIT-II		
3	Illustrate the TTT diagram for eutectoid steels with a neat sketch.	5
UNIT-III		
4	Predict various probable causes of fatigue failure	5
UNIT-IV		
5	Illustrate the process following metallurgical analysis parameters in brief. a) Grain Size b) Weld and heat affected zone.	5

PART-C (40 Marks)

UNIT-I		
6	Explain with neat sketches various types of point defects.	10
7	Distinguish between edge and screw dislocations.	10

UNIT-II		
8	Make an Iron Carbon diagram and mark all the micro constituents on it.	10
9	Illustrate the applications of heat treatment processes in industries. Distinguish between austempering and martempering processes.	10
UNIT-III		
10	Explain various factors affecting fatigue failure. Illustrate few practical examples of fatigue failure.	10
11	Explain the factors affecting creep failure. Defend the use of 'time' instead of 'stress' in creep curve as the independent variable.	10
UNIT-IV		
12	Explain the following metallographic characteristics involved in metallurgical analysis a) Phase analysis. b) Dendritic growth. c) Inter-granular attack. d) Inclusion size, shape and distribution.	10
13	Illustrate with neat sketch the working and application of scanning electron microscope.	10