

VEER SURENDRA SAI UNIVERSITY OF TECHNOLOGY, BURLA  
DEPARTMENT OF METALLURGICAL AND MATERIALS ENGINEERING  
SESSION 2016 - 17 (ODD SEMESTER)

Total Pages—4

(Set-T<sub>1</sub>)

**B.Tech - 7th(M & M)**  
**Surface Engineering**

Full Marks : 70

Time : 3 hours

Answer six questions including Q. No. 1  
which is compulsory

*The figures in the right-hand margin indicate marks*

Symbols carry usual meaning

1. Answer *all* questions : 2 × 10
- (a) Why iron and chromium cannot be deposited as an alloy under normal conditions ?
  - (b) What is the scope of surface engineering in ceramics and polymers ?
  - (c) What is the difference between Carbo-nitriding and Nitro-carburising ?

( Turn Over )

( 2 )

- (d) Write down the CVD reactions for the deposition of Si and SiO<sub>2</sub>.
- (e) In between the APCVD and LPCVD process, which one is mass transfer controlled and which one is reaction rate controlled and why?
- (f) Briefly explain surface treatment of a metal by Ion Implantation.
- (g) What are the advantages of Cu deposited by electrochemical method compared to Cu deposited by other methods?
- (h) Write down the advantages of cold wall reactor over hot wall reactor in a CVD process.
- (i) For deposition of TiN by sputter coating method from a Ti target material which gas should be used as a plasma generating gas and why?
- (j) If an aircraft flies through a dust cloud which type of wear process generally occurs and

how can you improve the wear resistance of the affected part.

2. (a) What is surface fatigue ? Write down the different forms of a surface fatigue wear process. 5
- (b) Describe the fretting wear process and write down the factors which affect the fretting wear process. 5
3. (a) Explain the different possible wear mechanisms if a material is failed due to low adhesive wear resistance. 5
- (b) In a slurry pipeline which type of wear process generally occur ? Briefly describe the slurry erosion process. 5
4. (a) Differentiate between the cathodic and anodic inhibitors used to prevent a material from failing due to low corrosion resistance. 5
- (b) What are absorption inhibitors and vapor phase inhibitors ? 5

( 4 )

5. (a) Determine the growth rate of a CVD film and also discuss the two limiting cases which affect the growth rate. 5
- (b) State the different PVD processes and discuss the sputter coating technique. 5
6. (a) With the help of a neat sketch explain the laser surface hardening method. 5
- (b) What are the high energy surface techniques used for surface hardening? Explain the electron beam hardening method. 5
7. (a) Classify the conventional diffusion hardening processes according to the depth of hardening. 5
- (b) Explain the surface hardening methods used for alloy steel and stainless steel. 5
8. Write short notes on any two :  $5 \times 2$
- (i) Electro-less plating
  - (ii) Thermal evaporation
  - (iii) Carbo-nitriding
  - (iv) Galvanizing.