MME 2017

(Set-T_1)

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 ?

(*d*) Write down the CVD ractions for the deposition of Si and SiO_2.

(*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

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 × 2

(*i*) Electro-less plating

(*ii*) Thermal evaporation

(*iii*) Carbo-nitriding

(*iv*) Galvanizing.