

Term End Examination, Nov - 2013  
S.Y. M. Tech Auto. Tech. CoEP (Sem III)  
Sub: Automotive Materials & Manufacturing

Date: 15.11.2013

Time: 10.00 to 01.00 pm.

Max. Marks: 100

**Instructions:**

1. Figures to right indicate full marks.
2. Draw neat figures wherever required.
3. Use of non-programmable calculator is allowed
4. Answers to both the sections should be written in same Answer sheet with a gap of one page.

**SECTION - I****1. Match the following:**

10X1/2=5

- |      |                  |   |  |
|------|------------------|---|--|
| i    | Cylinder Block   | a | Nodular cast iron, Si-Cr steel, stainless steel  |
| ii   | Piston           | b | Ni-resist cast iron, cast stainless steel, superalloy  |
| iii  | Camshaft         | c | High-Si cast iron, Ni-resist cast iron, cast stainless steel, stainless steel tube and sheet |
| iv   | Valve            | d | Al-Si-Sn and Cu-Pb alloys  |
| v    | Valve Seat       | e | Spring steel, music wire   |
| vi   | Valve Spring     | f | Gray cast iron, CGI, cast Al alloy   |
| vii  | Piston Pin       | g | Al-Si-Cu-Mg alloy  |
| viii | Turbo charger    | h | Chilled cast iron, Cr-Mo steel, iron based sintered metal                                    |
| ix   | Exhaust manifold | i | Heat-resistive steel, Ti alloy, SiC ceramics   |
| x    | Plain bearing    | j | Iron base sintered metal, cast iron  |

**2. State True or False:**

5X1=5

- a. In the forged crankshaft, the grain flow lines if open at fillet radii give improved fatigue life.
- b. Pearlite is a solid phase structure like austenite and ferrite in the steel
- c. In Malleable iron Magnesium / Celenium alloy addition is made for graphitization and control its shape.
- d. Compacted Graphite iron overall gives minimum 20% weight reduction for engine block and 5% for the complete engine.
- e. In SAE American steel classification system first two digits indicate % carbon in the steel.

**3. Answer the following:**

2X5=10

- a. Explain what advancement are done on Aluminium alloy as piston materials.
- b. Write a short note on Valve/Guide/Seat materials.

**4. Answer the following:**

1X10=10

- a. Explain how material is selected for a crankshaft and explain various steps required in hot forging.

**5. Answer the following:**

2X5=10

- a. Explain in detail about material selection process.
- b. Explain how cold-working affects the material properties.

6. Answer the following:

2X5=10

- a. Explain 4Cs in Global Manufacturing.
- b. List the different types of Rapid Prototyping systems and explain one in detail.

SECTION - II

1. Fill in the Blanks:

5X1=5

- a. Inverse Piezoelectric is known as \_\_\_\_\_, while Direct piezoelectric is known as \_\_\_\_\_.
- b. Nano composites exhibit \_\_\_\_\_ and \_\_\_\_\_ orientation.
- c. \_\_\_\_\_ find applications in EMI/RFI systems in automotive electronics.

2. Match the following:

10X1/2=5

Match the pairs for following polymers as semi-crystalline thermoplastics and amorphous thermoplastics.

PPO, PP, ABS, Acetal, Nylon, PVC, PC, HDPE, PTFE, Acrylics

Amorphous thermoplastics.	
Semi-crystalline thermoplastics	

3. Answer ANY TWO of the following:

2X10=20

- a. Describe the working principle of ferromagnetic SMA.
- b. Describe the working principle of Electro-active materials.
- c. Lamination theory in composites.

4. Answer ANY TWO the following:

2X5=10

- a. List the applications of SMA.
- b. Differentiate between Bio-plastics and petro-plastics.
- c. Explain in detail about part manufacturing techniques in nano-fiber composites.

5. Answer the following:

2X5=10

- a. The observation table below shows how the air resistance against certain heavy vehicle varies with road speed. Plot a graph of these figures on the base of road speed. From the graph determine the air resistance at a speed of 100km/h and 110km/h. Please do the same through series modelling techniques.

Vehicle Speed (km/h)	48	56	64	72	80	88	97	105
Wind Force (N)	510	690	899	1145	1280	1710	2012	1363

- b. Samples of five steel alloys were taken and their Brinell hardness numbers were recorded as below. The tensile strength values were determined experimentally and also recorded in the same table. What is the relationship between Brinell Hardness and tensile strength?

Check the mathematical model for: (a)  $Y = b X$ , and (b)  $Y = a + b X$

Steel Sample	Brinell Hardness (X)	Tensile Strength (Y)
1	500	256
2	431	212
3	370	189
4	321	155
5	285	138