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**Question Paper Code : 41050**

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2021.

Seventh Semester

Aeronautical Engineering

OML 753 – SELECTION OF MATERIALS

(Common to Aerospace Engineering/Automobile Engineering/Civil Engineering/Industrial Engineering/Industrial Engineering and Management/Manufacturing Engineering/Marine Engineering/Mechanical Engineering/Mechanical Engineering (Sandwich)/Mechatronics Engineering/Petrochemical Engineering/Production Engineering/Robotics and Automation/Bio Technology/Chemical Engineering/Chemical and Electrochemical Engineering/Food Technology/Petrochemical Technology/Petroleum Engineering/Pharmaceutical Technology/Plastic Technology/Polymer Technology)

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(Regulations 2017)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Classify Engineering materials based on their conductivity.
2. What is meant by smart materials? Give one example.
3. List any two significant mechanical properties of an engineering component.
4. Generally, materials having good thermal conductors are good electrical conductors except diamond which has good thermal conductivity but an insulator. Why?
5. Why fabrication properties are more important in selection of materials?
6. List any four manufacturing process for Al-Si alloys.
7. What are the differences between testing techniques of metals and polymers?

8. List any four testing organisations.
9. What are the prerequisites for selecting a material for medical applications?
10. Grey cast iron is brittle and the hardness is comparable to that of plain carbon steels but why is it selected for wear resistant applications?

PART B — (5 × 13 = 65 marks)

11. (a) (i) What is the effect of the structure on the properties of materials? Explain with an example. (6)
- (ii) Explain with an example the role of failure analysis of materials in applications. (7)

Or

- (b) Explain with an example the role of non functional aspects in selection of materials and processes. (7 + 6)
12. (a) Explain the major differences between physical properties and mechanical properties and define any three mechanical properties and physical properties. (6 + 7)

Or

- (b) Define shape factor and explain how it affects the selection process with a suitable example. (13)
13. (a) Discuss in detail the manufacturing methods involved in the production of plastic parts. (13)

Or

- (b) Explain the principle, advantages and limitations of Metal forming processing. (5 + 4 + 4)
14. (a) Discuss on the Ashby materials selection charts. (13)

Or

- (b) Explain any two non destructive techniques used for defecting the flaws in ceramics. (6 + 7)
15. (a) Select a suitable material for dental and bone implants for human and discuss their manufacturing technique. (6 + 7)

Or

- (b) Discuss on the advanced materials used in Telecommunication. (13)

PART C — (1 × 15 = 15 marks)

16. (a) Select a suitable process or combination of processes for connecting rods for automobiles. Explain. The material is AISI4340 steel with the following specifications. (15)

Cross section : Circular, Batch size 100 pieces, Weight of the connecting rod is 25 kg, surface roughness – 0.1 microns, section thickness –  $15 \pm 0.1$  mm and with cheaper cost.

Or

- (b) Among the following materials, which one will you choose for making cooking utensils? Justify your answer. (3 × 5 = 15)

- (i) Tin,
- (ii) Austenitic stainless steel
- (iii) Iron
- (iv) Aluminium and
- (v) Ceramics.