



**MAULANA ABUL KALAM AZAD UNIVERSITY OF  
TECHNOLOGY, WEST BENGAL**

**Paper Code : APM-704B**

**SMART GARMENTS**

*Time Allotted: 3 Hours*

*Full Marks: 70*

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words  
as far as practicable.*

**Group – A**

**(Multiple Choice Type Questions)**

1. Choose correct alternatives of the following: <http://www.makaut.com>

1×10=10

(i) The most suitable weave for ballistic protection is

(a) 2 × 2 twill weave

(c) plain weave

✓ (b) 2 × 2 basket weave

(d) 2 × 2 satin weave

(ii) NITINOL is not related to

(a) metal alloy

(c) austenitic and martensitic phase

(b) shape memory material

✓ (d) chemical deformation

(iii) The fibre not used for ballistic protection

✓ (a) Meta aramid

(c) Kevlar

(b) UHMPE

(d) PBO

(iv) Intelligent textiles cannot be divided into these groups <http://www.makaut.com>

(a) Phase Change Material

(c) Chromic Materials

(b) Shape Memory Materials

✓ (d) Gore-tex fabric

(v) ICP is not related to

(a) Intrinsically Conductive Polymer

✓ (c) High mechanical strength

(b) PEDOT or PSS fibre

(d) Brittle in nature

**Turn Over**

(vi) Self-Cleaning Fabrics is *not* related to

- (a) Titanium dioxide
- (b) Nano particle of 20 nanometers in diameter
- ✓ (c) Destroy of free-radical oxygen
- (d) Oxidation-reduction reactions

(vii) 4 W is *not* related to

- ✓ (a) Wicking
- (b) Wear
- (c) Wrinkle
- (d) Wash

(viii) Pressure response Fabric is *not* related to <http://www.makaut.com>

- (a) soft malleable material.
- (b) hardens on impact.
- ✓ (c) hardens on presence of temperature.
- (d) D<sub>3</sub>O

(ix) Smart and interactive application of carbon fibres is *not* influenced by

- (a) high stiffness and brittleness.
- (b) aesthetic considerations.
- (c) health-related issues.
- ✓ (d) good aesthetic property.

(x) Polyaniline, polythiophene, polypyrrole and polyacetylene fibres are *not* related to

- (a)  $\pi$  bond
- (b) Conjugated statement
- ✓ (c)  $\alpha$  bond
- (d) Carbon-carbon double bonds

### Group – B

(Short Answer Type Questions)

Answer *any three* of the following.

5×3=15

2. Explain 'Shattering effect controls the use of ceramic fibre is ballistic protection'.

✓ 3. (a) What are six basic factors of thermal comfort? <http://www.makaut.com>

(b) What are suitable properties for UV protective garment?

3+2=5

4. Explain the properties of fibre for soft body armour.

5. Discuss about the advantages and disadvantages of hard body armour.

2½+2½=5

6. Give detail classification of Smart Interactive Textiles (SIT).

**Group – C**

**(Long Answer Type Questions)**

**Answer any three of the following.**

15×3=45

7. (a) What is a shape memory material? <http://www.makaut.com>  
(b) Explain the mechanism of the shape memory effect (SME cycle) for metallic alloys with suitable diagram.  
(c) Discuss about the use of SMM for textile (3 uses). 1+(3+2)+9=15
8. (a) Explain the use of an Auxitex material and chitosan fibre as controlled drug delivery system.  
(b) Why Aliginatex fibre consider as smart 'wound care manager'?  
(c) Prepare a comparative table for selection criterion of textile fibre for medical application with suitable examples. (2+2)+5+6=15
9. (a) Prepare a comparative table for mentioning the fibre, yarn and fabric factors controlling heat and moisture management for thermal comfort.  
(b) Explain the waterproof breathable fabrics and moisture management fabric with suitable diagram. 9+(3+3)=15
10. Discuss about three common devices used for thermal comfort like: <http://www.makaut.com> 5×3=15  
(i) Air cooling system  
(ii) Air cooling system  
(iii) Ice or cold pack system
11. Discuss about the three high performance fibres for ballistic protection with suitable chemical structures. 15
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