STRATEGY FOR GATE

MAN

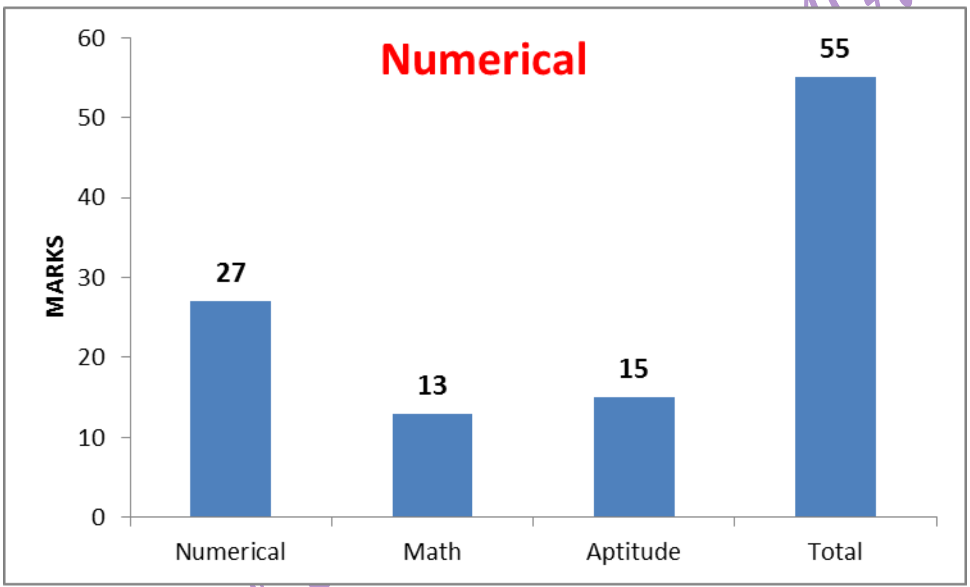
M- MATH

A- APTITUDE

N-NUMERICAL

COMPLETE ANALYSIS OF GATE 2017 PAPER

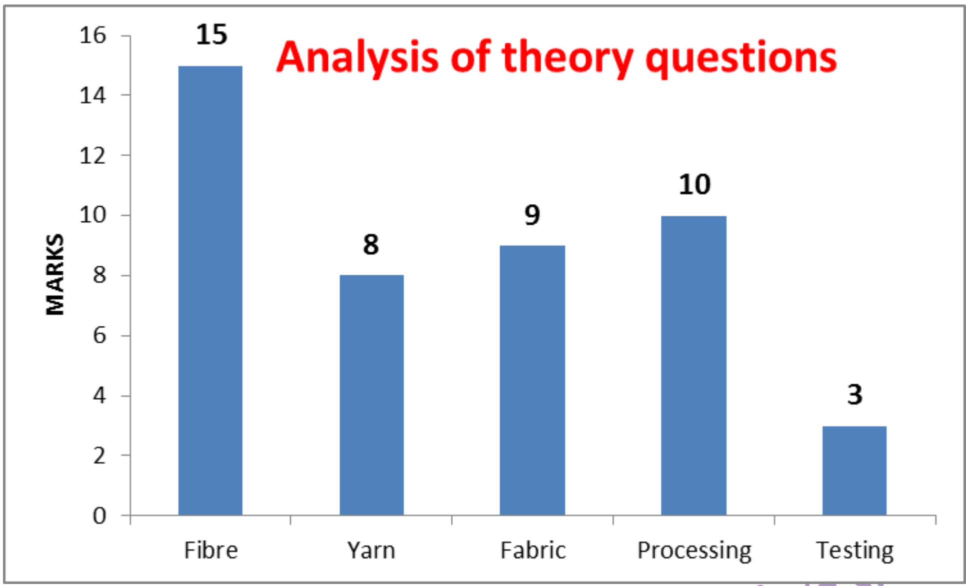
	Numerical	Math	Aptitude	Total
Marks	27	13	15	55



So guys, If you will follow "MAN" strategy, you can secure upto 55 marks very easily.

GATE 2017		
Question No	Topic	Sub Topic
1	Engineering mathematics	Vector
2	Engineering mathematics	Laplace
3	Engineering mathematics	Differentiation
4	Fibre	Identification of fibres
5	Fibre	Polymerisation of fibres
6	Fibre	Classification of fibres
7	Fibre	Heat setting of synthetic fibres
8	Fibre	Melt spinning
9	Yarn	Carding
10	Yarn	Comparison of carding, combing, draftting
11	Yarn	Ring spinning
12	Yarn	Combing
13	Fabric	Warp/weft breakage
14	Fabric	Shuttleless weaving
15	Fabric	Knitting
16	Fabric	Nonwoven
17	Testing	Sampling
18	Fibre	Properties of fibres
19	Testing	Coefficient of variation
20	Fabric	Weaving defects
21	Testing	Statistics
22	Fibre	Properties of fibres
23	Processing	Flame retardent finishing
24	Processing	Dyeing defects
25	Numerical	Mole
26	Engineering mathematics	Probability & Statistics
27	Engineering mathematics	Trapezoidalm & simpson rule
28	Engineering mathematics	Differential equation
29	Engineering mathematics	Matrix
30	Engineering mathematics	Function
31	Fibre	Spinning of synthetic fibres
32	Numerical	Degree of polymerization
33	Fibre	Gross & fine structure of fibres
34	Fibre	Properties of fibres
35	Numerical	Molecular weight
36	Numerical	Theory of yarn structure
37	Numerical	Rotor
38	Numerical	Speed frame
39	Numerical	Number of fibres
40	Yarn	Comparison of spinning processes of staple fibes
41	Numerical	Neddle punching

42	Fabric	Sizing
43	Numerical	GSM
44	Numerical	Winding
45	Fabric	Types of weave
46	Fibre	Properties of fibres
47	Numerical	Bundle tenacity
48	Numerical	Tenacity
49	Numerical	Compression testing
50	Yarn	Theory of yarn structure
51	Processing	Dyeing machines
52	Processing	Preparatory processes
53	Processing	Water repellent finishing
54	Numerical	finishing
55	Processing	Method of printing
56	GA	Verbal
57	GA	Verbal
58	GA	Geometry
59	GA	Statistics
60	GA	Logical reasoning
61	GA	Verbal
62	GA	Missing digits
63	GA	Inequality
64	GA	Logical reasoning
65	GA	D.I.



<u>For GATE, Yarn (Spinning), Testing, Fabric (winding, sizing) are most important topics, because these topics are completely based on concepts, fundamentals.</u>

Processing & Fibre are least important topics because syllabus of these topics are very broad & these topics are completely based on memory based.

FIBRE

1. Classification of fibres

Cotton - Natural, Cellulosic, Vegetable, Seed, Unicellular, Staple

Kapok - Natural, Cellulosic, Vegetable, Seed, Unicellular, Staple

Kenaf - Natural, Cellulosic, Vegetable, Stem, Staple

Flex – Natural, Bast, Cellulosic, Vegetable, Stem, Unicellular, Staple

Hemp – Natural, Bast, Cellulosic, Vegetable, Stem, Multicellular, Staple

Jute – Natural, Bast, Cellulosic, Vegetable, Stem, Multicellular, Staple

Ramie – Natural, Bast, Cellulosic, Vegetable, Stem, Multicellular, Staple

Sisal – Natural, Cellulosic, Vegetable, Leaf , Staple

Abaca(manilla) - Natural, Cellulosic, Vegetable, Leaf , Staple

Coir – Natural, Cellulosic, Vegetable, Fruit

Wool - Natural, Protein, Animal, Staple

Silk - Natural, Protein, Animal, Filament

Asbestos - Natural, Mineral, Staple

Cupro – Man-made, Regenerated, Rayon

Polynosic (modal) – Man-made, Regenerated, Rayon

Viscose- Man-made, Regenerated, Rayon

Lyocell - Man-made, Regenerated, Rayon

Acetate – Man-made, Regenerated

Triacetate - Man-made, Regenerated

Polyester – Man-made, Synthetic, Organic

Nylon – Man-made, Synthetic, Organic

Acrylic – Man-made, Synthetic, Organic

Polypropylene – Man-made, Synthetic, Organic

Polyethylene - Man-made, Synthetic, Organic

Glass – Man-made, Synthetic, Inorganic

Carbon - Man-made, Synthetic, Inorganic

2. Essential requirements of fiber forming polymers

Polymer should be linear, cohesive, oriented. Long length of polymer gives more cohesive point between polymer chains, linear polymer forms crystalline region.

3. Gross and fine structure of natural fibers

a. Cotton

- Cuticle is the outermost layer of cotton fiber. It contains wax. It protects the fiber from chemical and other degrading agents. This layer is removed from the fiber by scouring.
- Primary cell wall is immediately present underneath the cuticle. It consists of small strands of cellulose, called fibrils.
- Secondary wall present beneath the primary cell wall. It also consists of fibrils. Fibrils make spirals with fiber axis, which is called twist of convolution.
- Fibrils act like very fine capillaries which contribute greatly to cotton's wipe-dry performance.
- Lumen is the hollow canal that runs the length of the fiber.
- Cotton fiber has bean or kidney-shaped cross-section because when fiber matures, sap from lumen evaporates so pressure inside the fiber becomes less than the atmospheric pressure on the outside. This caused the fiber to collapse inward resulting in the bean or kidney-shaped cross-section of the cotton fiber
- **4. Polymer of natural and man-made fibers**
- **a. Cotton**
- Polymer of cotton is cellulose. Cellulose is an organic compound with the formula $(C_6H_{10}O_5)_n$, a polysaccharide consisting of a linear chain of several

hundred to many thousands of β(1→4) linked D-glucose units. The repeating unit in the cotton has two glucose units, called cellobiose. In cellulose two Cotton consists of about 5000 cellobiose units. Its degree of polymerization is thus 5000. Alpha glucose is the monomer unit in starch; beta glucose is the monomer unit in cellulose. α-glucose and β-glucose are stereoisomers - they differ in the 3-dimensional configuration of atoms/groups at one or more positions. The molecular formula for glucose is $C_6H_{12}O_6$. D-glucose and L-glucose are called enantiomers because their molecular structures are mirror images of each other. Therefore, the key difference between D and L glucose lies in their structure. D-glucose is also known as dextrose. Unlike L-glucose, it occurs widely in nature. For example, it is used as an energy source in most living organisms ranging from bacteria to human. These organisms get energy from D-glucose through aerobic or anaerobic respiration or fermentation. L-glucose naturally occurs in fruits and other parts of plants in its free state. However, it is not found in higher living organisms. But, it can be synthetically produced in the laboratory.L-Glucose does not occur naturally in higher living organisms, but can be synthesized in the laboratory.

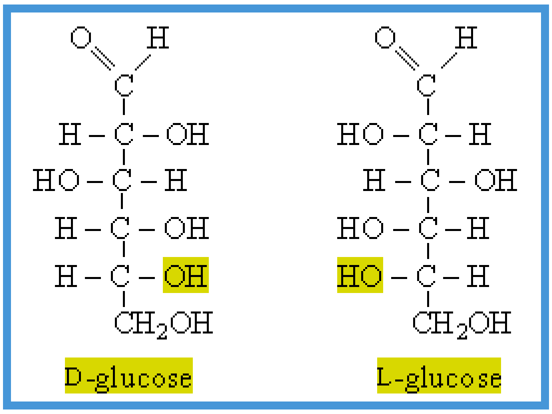


Figure: 2 Glucose polymer (Fischer projection)

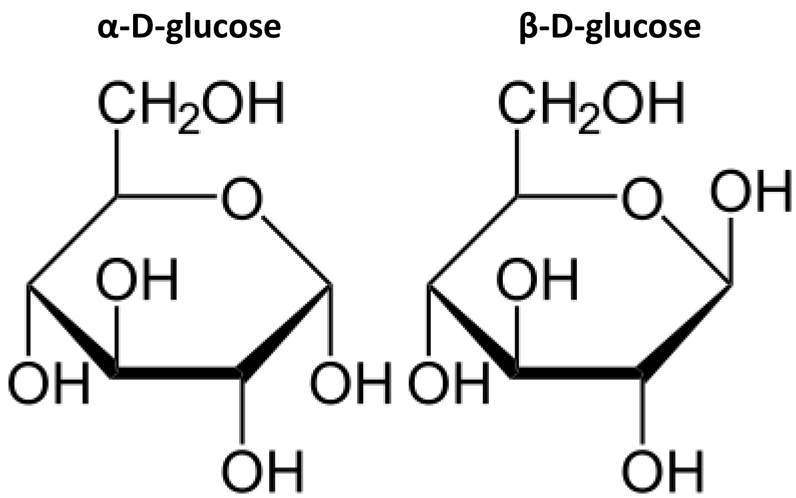


Figure: 2 Glucose polymer (Haworth projection)

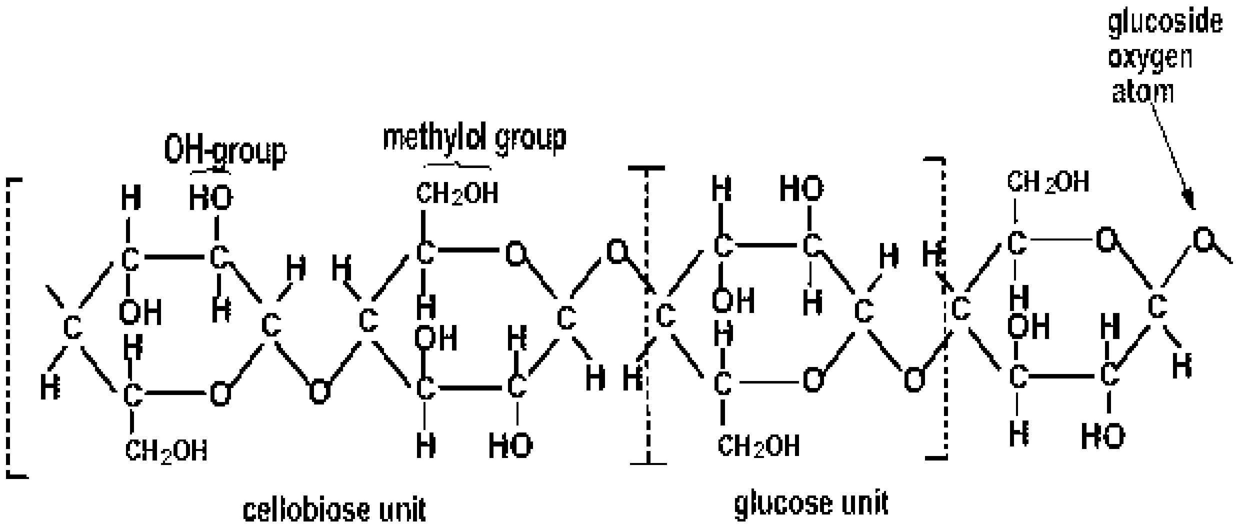


Fig: 3 The chemical formula of the cellulose polymer

YARN

Blow Room

Points to remember

- Neps increases in blow room.
- Short fibre content increases with fibre openness.
- As degree of cleaning increases fibre loss, fibre damage, neps also increases
- Opening of fibre increases with decrease in setting of beating element.
- Setting between feed rollers is different for different fibre types, eg. wider for longer fibres (synthetic fibres)
- It is advisable to run the fans at optimum speeds. Higher fan speeds will increase the material velocity and will create turbulence in the bends. This will result in curly fibres which will lead to entanglements.
- High fan speed, which will result in high velocity of air will increase neps in fibre.
- Number of cleaning points is decided on the basis of the amount of trash, the number of trash particles and the type of trash particles.
- Number of cleaning points is also decided on the basis of based on type of ginning (Cleaning points will be lower for saw ginned cotton as compare to roller ginned cotton because saw ginning is more harsh as compare to roller ginning).
- Since blow room requires more space and power, it is better to make use of the maximum production capacity of the machines
- Fibre rupture should be checked for each opening point. 2.5 % span length should not drop by more than 3% . If the uniformity ratio drops by more than 3%, then it is considered that there is a fibre rupture.

CARD

Points to remember

- Carding machine speed is higher for natural fibre as compare to synthetic fibre, because synthetic fibre has longer length. As the length of fibre increases its bending rigidity decreases so its flexibility increases and so there will be higher probability of entanglement of fibres. If there is higher entanglement there is higher propensity of neps.
- Carding machine setting is wider for synthetic fibre, because synthetic fibre has longer length. If there is narrow setting in carding machine, there is higher probability of fibre rupture, fibre breakage, fibre loss.
- Carding clothing is of three types those are Metallic clothing, semi rigid clothing, flexible clothing .
- Metallic clothing is used for licker-in, cylinder, doffer.
- Flexible clothing or semi rigid clothing are used in flat.
- More waste is generated with flexible clothing as compare to metallic and semi rigid clothing, because contact area between fibre and wire point will be higher for flexible clothing, so more fibre will stick with flexible clothing and so probability of a fibre to rotate with roller will increases, the probability of a fibre to transfer from one roller to another roller decreases, so there will be more chances for fibre entanglements and so that neps.
  - Metallic clothing gives higher production as compare to flexible clothing, and semi rigid clothing.

Reason

- Less waste is generated with metallic clothing.

- More wire point density is required for fine fibres.

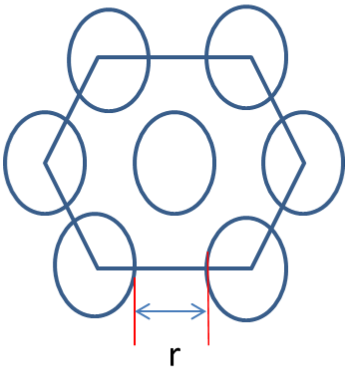
Reason

  - In case of finer fibres, no of fibres will be higher per unit volume, so more number of wire points is required per unit volume of sliver.

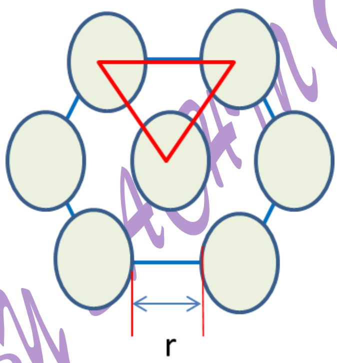
- Cylinder speed increases neps decreases.
- Sharpness of tooth of carding machine increases, neps decreases.
- Closed setting, increased speed reduces nep level
- Blow room machinery lay out should be desined in such a way that there should be minimum number of bends, and there should not be sharp bends to avoid fibre entanglements.
- Fibre travelling surface should be smooth and clean
- *Wire point density increases from first machine to last machine*
- *Wire point height decreases from first machine to last machine*
- Opening of fibre increases with decrease in setting of beating element.
- Blowroom cleaning efficiency increases with increase in fibre openness after reaching to maximum efficiency it drops sharply with further increase in openness.

GATE 2017 PAPER SOLUTION

36) CORRECT ANSWER- (.4)



HEXAGONAL PACKING OF FIBRES



Explanation

For calculating packing unit we consider a repeat part of hexagonal packing-

Radius of fibre = r

Distance between adjacent fibre = r

$$\text{Packing density} = \frac{\text{area occupied by fibres}}{\text{area occupied by yarn}}$$

$$= \frac{\text{area of sectors of circle inside the red triangle}}{\text{area of red triagle}}$$

Side of red triangle = 3r

Area of red triangle = $(\sqrt{3}/4) \times (3r)^2$

Area of sectors of circle inside the red triangle = $3 \times (1/2) \times r^2 \times \pi/3$

So,

$$\text{Packing density} = \frac{\text{area of sectors of circle inside the red triangle}}{\text{area of red triagle}}$$

$= \{3 \times (1/2) \times r^2 \times \pi/3\}/\{(\sqrt{3}/4) \times (3r)^2\}$

$= .4028$