

The Graduate Aptitude Test in Engineering

GATE 2023 Question Paper

GATE is an entrance examination conducted in India that primarily tests the comprehensive understanding of undergraduate subjects in engineering and sciences for admission into technical postgraduate programs.

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General Aptitude (GA)

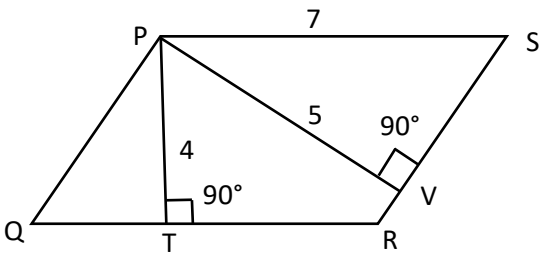
Q.1 – Q.5 Carry ONE mark Each

Q.1	"You are delaying the completion of the task. Send _____ contributions at the earliest."
(A)	you are
(B)	your
(C)	you're
(D)	yore

Q.2	References : _____ : : Guidelines : Implement (By word meaning)
(A)	Sight
(B)	Site
(C)	Cite
(D)	Plagiarise

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Q.3	In the given figure, PQRS is a parallelogram with PS = 7 cm, PT = 4 cm and PV = 5 cm. What is the length of RS in cm? (The diagram is representative.)
	
(A)	$\frac{20}{7}$
(B)	$\frac{28}{5}$
(C)	$\frac{9}{2}$
(D)	$\frac{35}{4}$

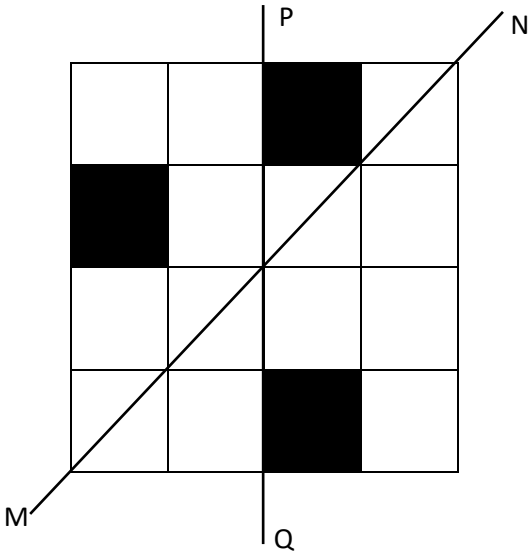
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Q.4	In 2022, June Huh was awarded the Fields medal, which is the highest prize in Mathematics. When he was younger, he was also a poet. He did not win any medals in the International Mathematics Olympiads. He dropped out of college. Based only on the above information, which one of the following statements can be logically inferred with *certainty*?
(A)	Every Fields medalist has won a medal in an International Mathematics Olympiad.
(B)	Everyone who has dropped out of college has won the Fields medal.
(C)	All Fields medalists are part-time poets.
(D)	Some Fields medalists have dropped out of college.

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Q.5	A line of symmetry is defined as a line that divides a figure into two parts in a way such that each part is a mirror image of the other part about that line. The given figure consists of 16 unit squares arranged as shown. In addition to the three black squares, what is the minimum number of squares that must be coloured black, such that both PQ and MN form lines of symmetry? (The figure is representative)
	
(A)	3
(B)	4
(C)	5
(D)	6

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Q.6 – Q.10 Carry TWO marks Each

Q.6	Human beings are one among many creatures that inhabit an imagined world. In this imagined world, some creatures are cruel. If in this imagined world, it is given that the statement "Some human beings are not cruel creatures" is FALSE, then which of the following set of statement(s) can be logically inferred with *certainty*? (i) All human beings are cruel creatures. (ii) Some human beings are cruel creatures. (iii) Some creatures that are cruel are human beings. (iv) No human beings are cruel creatures.
(A)	only (i)
(B)	only (iii) and (iv)
(C)	only (i) and (ii)
(D)	(i), (ii) and (iii)

Q.7	To construct a wall, sand and cement are mixed in the ratio of 3:1. The cost of sand and that of cement are in the ratio of 1:2. If the total cost of sand and cement to construct the wall is 1000 rupees, then what is the cost (in rupees) of cement used?
(A)	400
(B)	600
(C)	800
(D)	200

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Q.8	The World Bank has declared that it does not plan to offer new financing to Sri Lanka, which is battling its worst economic crisis in decades, until the country has an adequate macroeconomic policy framework in place. In a statement, the World Bank said Sri Lanka needed to adopt structural reforms that focus on economic stabilisation and tackle the root causes of its crisis. The latter has starved it of foreign exchange and led to shortages of food, fuel, and medicines. The bank is repurposing resources under existing loans to help alleviate shortages of essential items such as medicine, cooking gas, fertiliser, meals for children, and cash for vulnerable households. Based only on the above passage, which one of the following statements can be inferred with *certainty*?
(A)	According to the World Bank, the root cause of Sri Lanka's economic crisis is that it does not have enough foreign exchange.
(B)	The World Bank has stated that it will advise the Sri Lankan government about how to tackle the root causes of its economic crisis.
(C)	According to the World Bank, Sri Lanka does not yet have an adequate macroeconomic policy framework.
(D)	The World Bank has stated that it will provide Sri Lanka with additional funds for essentials such as food, fuel, and medicines.

Q.9	The coefficient of x^4 in the polynomial $(x-1)^3(x-2)^3$ is equal to _____.
(A)	33
(B)	-3
(C)	30
(D)	21

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Q.10	Which one of the following shapes can be used to tile (completely cover by repeating) a flat plane, extending to infinity in all directions, without leaving any empty spaces in between them? The copies of the shape used to tile are identical and are not allowed to overlap.
(A)	circle
(B)	regular octagon
(C)	regular pentagon
(D)	rhombus

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Q.11 – Q.35 Carry ONE mark Each

Q.11	The value of x for which the inverse of the following matrix does not exist is
	$\begin{bmatrix} 1 & 3 & 0 \\ 2 & x & 4 \\ -1 & 0 & 2 \end{bmatrix}$
(A)	0
(B)	1
(C)	10
(D)	12
Q.12	The value of y for which the following limit exists is
	$\lim_{x \to 1} \frac{2x^2 - yx - x + 3}{3x^2 - 5x + 2}$
(A)	2
(B)	3
(C)	4
(D)	5

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Q.13	The probability of the standard normal variable taking values between 0 and 1 is 0.3413, between 0 and 2 is 0.4772, and between 0 and 3 is 0.4987. The average of marks in an examination is 68 and the standard deviation is 10. The percentage of examinees getting less than 48 marks is
(A)	2.28
(B)	10.31
(C)	47.72
(D)	52.78
Q.14	The amide linkage is NOT present in
(A)	Wool
(B)	Aramid
(C)	Lyocell
(D)	Nylon 66

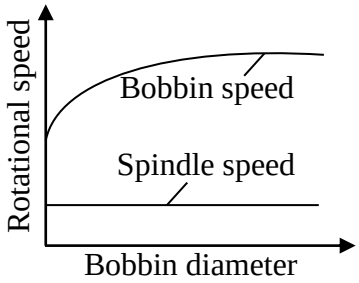
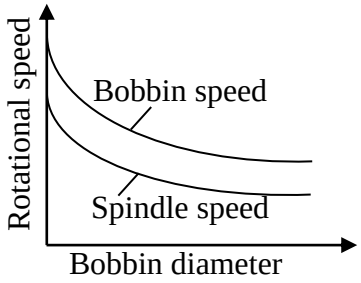
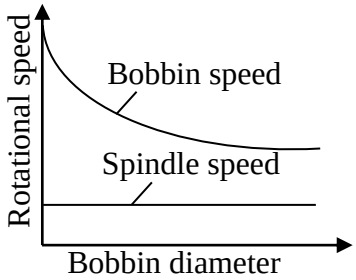
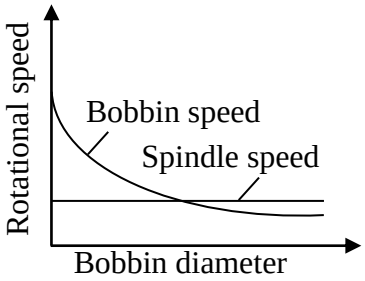
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Q.15	In the amorphous phase, polymer chains prefer to be in a random coil conformation to
(A)	Maximize entropy
(B)	Maximize enthalpy
(C)	Minimize entropy
(D)	Minimize enthalpy
Q.16	The spinning system that inserts false twist is
(A)	Ring spinning
(B)	Compact spinning
(C)	Air-jet spinning
(D)	Air-vortex spinning

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Q.17	In a bobbin leading roving frame, the correct relationship between spindle speed and bobbin speed is
(A)	
(B)	
(C)	
(D)	

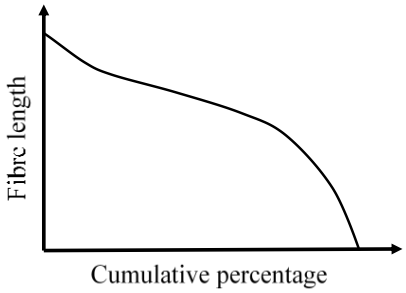
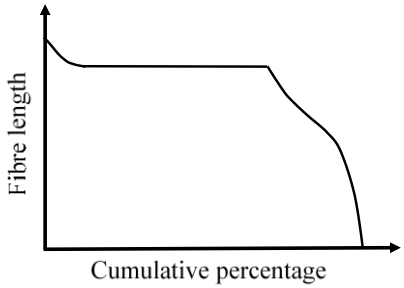
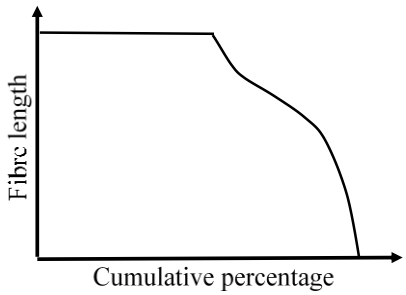
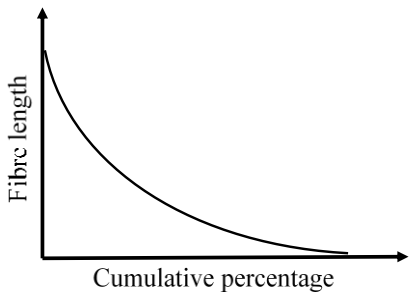
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Q.18	The bonding process followed for production of highloft nonwoven is
(A)	Needle punching
(B)	Hydroentanglement
(C)	Calendar bonding
(D)	Through-air bonding
Q.19	A drum-driven winder is fitted with a 3-diamond drum. The number of revolutions of the drum for single traverse is
(A)	1.5
(B)	3
(C)	6
(D)	9

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Q.20	The cut length of a staple polyester fibre is approximately equal to the effective length of a specific variety of long staple cotton fibre. When these two types of fibres are blended in nearly equal proportion, the typical comb sorter diagram of the blended fibre-tuft is
(A)	
(B)	
(C)	
(D)	

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Q.21	During the measurement of cotton fibre fineness (micronaire) by air flow method, a higher quantity of cotton fibre is taken by mistake than specified. The reading of micronaire value from the instrument will be
(A)	Higher for any fibre fineness
(B)	Lower for any fibre fineness
(C)	Lower for only coarser fibres
(D)	Lower for only finer fibres
Q.22	Amongst the following, hydrolytic desizing agents attack starch at
(A)	α-1, 4 glucosidic linkage
(B)	Six membered ring
(C)	Hydroxyl group
(D)	Carboxyl group

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Q.23	In resist style of printing, the preferred arrangement for dyeing is
(A)	Kiss roll applicator
(B)	Nip padding
(C)	Immersion padding with vertical roller arrangement
(D)	Immersion padding with horizontal roller arrangement
Q.24	If twist factor is same for a set of cotton yarns, then the yarns have same
(A)	Linear density
(B)	Turns per metre
(C)	Packing density
(D)	Angle of twist of surface fibres

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Q.25	Copolymers are present in
(A)	Nylon 6 fibre
(B)	Nylon 66 fibre
(C)	Acrylic fibre
(D)	PET fibre
Q.26	Amongst the following weft knitted structures, double jersey structure(s) is/are
(A)	Rib
(B)	Interlock
(C)	Single cross tuck
(D)	Eight lock

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Q.27	For the same turns per unit length, as the yarn becomes coarser
(A)	Twist angle decreases
(B)	Twist angle increases
(C)	Twist multiplier decreases
(D)	Twist multiplier increases
Q.28	In flame retardant finishing of cotton fabric, the correct statement(s) is/are
(A)	The finishing material forms an insulating layer around the fibre at a temperature above the fibre pyrolysis temperature
(B)	The finishing material forms an insulating layer around the fibre at a temperature below the fibre pyrolysis temperature
(C)	The finishing material crosslinks cellulose and alters the pyrolysis route
(D)	The finishing material dehydrates the cellulose
Q.29	The Newton-Raphson method is being used for two iterations to find an approximate solution of the equation $e^x - 1 = 0$ with an initial guess of 1. The difference between the actual and approximate solutions (*rounded off to 2 decimal places*) is _____.
Q.30	The area under the curve $y = x^2 + 2x$ between $x = 0$ and $x = 4$, using the trapezoidal rule with a step size of one, (*in integer*) is _____.

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Q.31	A PET sample with 40 % crystallinity shows only a melting endotherm in the first heating cycle of DSC with a melting enthalpy of 50 J/g. The degree of crystallinity (%) of another PET sample which also shows only a melting endotherm but with a melting enthalpy of 80 J/g is (*in integer*) _____.
Q.32	If the twist multiplier in the indirect system is 4.8 tpi/$Ne^{0.5}$, then the twist factor in the direct system (tpm $tex^{0.5}$) (*rounded off to 2 decimal places*) is _____.
Q.33	A plain woven fabric with 20 ends per cm and 30 picks per cm is prepared with 30 tex warp yarns and 25 tex weft yarns. Neglecting yarn crimp, the areal density (g/m^2) of the fabric (*in integer*) is _____.
Q.34	A ring spun yarn with mean linear density of 32 tex is produced from 2 denier polyester staple fibre. If the standard deviation of the yarn linear density is 3.2 tex, then the index of irregularity of the yarn (*up to 1 decimal place*) is _____.
Q.35	A cotton fabric is to be dyed with 2 % shade (on the weight of fabric). If dye concentration is 0.4 g/L, then the material-to-liquor ratio is 1 : *X*. The value of *X* (*in integer*) is _____.

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Q.36 – Q.65 Carry TWO marks Each

Q.36	Two eigenvalues of the following matrix are 3 and 6. The third eigenvalue is
	$\begin{bmatrix} -2 & -4 & 2 \\ -2 & 1 & 2 \\ 4 & 2 & 5 \end{bmatrix}$
(A)	–5
(B)	–1
(C)	1
(D)	4
Q.37	Two vertical poles of height 6 m and 18 m are 10 m apart on a flat ground. A string needs to be connected from the top of one pole to a peg on the ground and then on to the top of the other pole. The minimum length (m) of the string is
(A)	25
(B)	26
(C)	27
(D)	28

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Q.38	Consider the following statements regarding Nylon 6 production from caprolactam using water as a catalyst. P. The first reaction involving ring-opening of caprolactam with water is an endothermic reaction Q. Increase in water concentration during the polycondensation results in a higher molecular weight polymer R. The polycondensation is an irreversible reaction S. Increase in temperature during the polycondensation results in a lower molecular weight polymer The correct combination of TRUE statements is
(A)	P and Q
(B)	Q and R
(C)	R and S
(D)	S and P
Q.39	Determine the correctness or otherwise of the following Assertion [a] and Reason [r]. [a]: In boiling water, polyester POY shows higher shrinkage than polyester FDY [r]: Molecular chain orientation is higher in polyester FDY than in polyester POY
(A)	Both [a] and [r] are true and [r] is the correct reason for [a]
(B)	Both [a] and [r] are true but [r] is not the correct reason for [a]
(C)	Both [a] and [r] are false
(D)	[a] is true but [r] is false

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Q.40	Consider the following activities on a carding machine P. Lowering surface speed of feed roller Q. Increasing rotational speed of taker-in R. Increasing linear density of feed material S. Use of shorter and finer fibres The correct combination of the above activities to obtain more number of taker-in teeth acting per fibre is
(A)	P and Q
(B)	Q and R
(C)	R and S
(D)	S and P

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Q.41	Consider the following statements with regard to the timing diagram of a cotton combing machine. P. In forward feed system, feeding mostly takes place when nippers are closing Q. Cylinder comb starts combing after feeding ends R. Detaching rollers move backward during forward movement of nipper assembly S. Top comb is not combing when detaching rollers move forward The correct combination of TRUE statements is
(A)	P and Q
(B)	Q and R
(C)	R and S
(D)	S and P

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Q.42	Consider the following reasons of shuttle loom stoppage. P. Breakage of warp yarns Q. Entrapment of shuttle inside the shed R. Flying of shuttle out of the shed S. Slackening of a warp yarn The correct combination that triggers the warp protector motion is
(A)	P and Q
(B)	Q and R
(C)	R and S
(D)	S and P
Q.43	In warp knitting, the lapping movement having only under-lap is
(A)	Closed lap
(B)	Open lap
(C)	Laying-in
(D)	Miss-lapping

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Q.44	Determine the correctness or otherwise of the following Assertion [a] and Reason [r] [a]: $MgCl_2$ is used in the formulation of anti-crease finishing of cotton fabric with DMDHEU [r]: $MgCl_2$ is an acidic salt and acts as a catalyst
(A)	Both [a] and [r] are true and [r] is the correct reason for [a]
(B)	Both [a] and [r] are true but [r] is not correct reason for [a]
(C)	Both [a] and [r] false
(D)	[a] is true but [r] is false
Q.45	Determine the correctness or otherwise of the following Assertion [a] and Reason [r] [a]: A partially scoured cotton fabric bleached with H_2O_2 exhibits higher water absorbancy than that bleached with $NaClO_2$ [r]: Bleaching with H_2O_2 also facilitates scouring
(A)	Both [a] and [r] are true and [r] is the correct reason for [a]
(B)	Both [a] and [r] are true but [r] is not correct reason for [a]
(C)	Both [a] and [r] false
(D)	[a] is true but [r] is false

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Q.46	In wet spinning of acrylic fibres
(A)	Two-way mass transfer is involved
(B)	One-way mass transfer is involved
(C)	Coagulation bath having spinneret contains only solvent
(D)	Coagulation bath having spinneret contains both solvent and non-solvent
Q.47	Drafting force in drawframe, when fibres are sliding, reduces with higher
(A)	Draft
(B)	Roller setting
(C)	Fibre length
(D)	Number of fibres in feed sliver

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Q.48	The force exerted by the reed on the cloth-fell at the instant of beat-up (weaving resistance) depends on
(A)	Free length of warp yarn
(B)	Elastic modulus of loom-state fabric
(C)	Elastic modulus of warp yarn
(D)	Elastic modulus of weft yarn
Q.49	With reference to KES-FB and FAST systems, the same low stress mechanical property is measured by
(A)	KES-FB1 and FAST 1
(B)	KES-FB2 and FAST 2
(C)	KES-FB3 and FAST 1
(D)	KES-FB2 and FAST 3

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Q.50	With reference to the work factor (WF) and work of rupture (WR) of two yarns with same breaking load and same breaking elongation, the correct statement(s) is/are
(A)	The WR of yarn with WF = 0.3 is more than that with WF = 0.5
(B)	The WR of yarn with WF = 0.3 is less than that with WF = 0.5
(C)	If breakage takes place within the Hooke's region, then the WF is more than 0.5
(D)	If breakage takes place within the Hooke's region, then the WF is equal to 0.5
Q.51	Amongst the Classimat faults A2, B1, D4, H2 and I1, the correct statement(s) is/are
(A)	D4 and A2 are the thickest fault and the shortest fault, respectively
(B)	I1 and H2 are the longest fault and the thinnest fault, respectively
(C)	D4 and I1 are the thickest fault and the thinnest fault, respectively
(D)	B1 and H2 are the most objectionable fault and the longest fault, respectively

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Q.52	A sample of cotton fabric is dyed with vat dye at 60 °C till equilibrium dye uptake is reached. Another sample of the same cotton fabric is dyed with the same dye at 90 °C till equilibrium, keeping all other parameters same. Amongst the following, the correct statement(s) is/are
(A)	Dye exhaustion will be higher at 90 °C as compared to that at 60 °C
(B)	Dye exhaustion will be lower at 90 °C as compared to that at 60 °C
(C)	Levelness achieved at 90 °C will be higher as compared to that at 60 °C
(D)	Levelness achieved at 90 °C will be lower as compared to that at 60 °C
Q.53	In pigment printing of cotton fabric, the pigment (along with binder) can be fixed by using
(A)	Saturated steam at 102 °C for 4 min
(B)	Dry heat at 140 °C for 4 min
(C)	Dry heat at 60 °C for 4 min
(D)	Super-heated steam at 180 °C for 4 min
Q.54	If $\frac{dy}{dx} = 8y^2x^3$ and $y(2) = 1$, then $\frac{1}{y(0)}$ (*in integer*) is _____.

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Q.55	If the values of x are 1, 2 and 3 and the corresponding values of y are 9, 8 and 10, respectively, then the slope of the line of regression equation of y on x is (*up to 1 decimal place*) _____.
Q.56	Three monodisperse Nylon 6 samples with molar masses 10000 g/mol, 30000 g/mol and 60000 g/mol are mixed in a proportion of 1:1:2 by number of chains. The polydispersity index of the resulting sample (*rounded off to 2 decimal places*) is _____.
Q.57	In melt spinning of a monofilament, a polymer is being extruded at a volumetric flow rate of 5×10^{-5} m^3/s through a spinneret of circular cross-section. If the take up velocity of the first winder is 100 m/s with a draw ratio of 50, then the diameter (mm) of the spinneret orifice (*rounded off to 2 decimal places*) is _____.
Q.58	In a roving frame, the ratio of the diameter of the top (driver) cone-drum to the diameter of the bottom (driven) cone-drum is inversely proportional to bobbin diameter. At an instant, Top cone-drum diameter = 212 mm Bottom cone-drum diameter = 108 mm Bobbin diameter = 54 mm When the bobbin diameter becomes 100 mm, the ratio of the top cone-drum diameter to the bottom cone-drum diameter (*up to 2 decimal places*) is _____.
Q.59	In a ring frame, the speeds of traveller at 50 mm bobbin diameter (near the base of the cop) and at 25 mm bobbin diameter (near the tip of the cop) are 13500 rpm and 13400 rpm, respectively. The nominal twist (tpm) (*rounded off to 2 decimal places*) is _____.

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Q.60	A circular knitting machine of 26 inch diameter and 20 gauge with 120 feeders is running at 30 rpm to produce a plain knitted fabric by using 30 tex yarn. If the loop length is 3 mm, then the rate of production (kg/h) of the machine (*rounded off to 1 decimal place*) is _____.
Q.61	A square jammed plain cotton woven fabric is produced from 10 Ne yarn of circular cross-section. Assuming density of yarn as 0.91 g/cm^3, the number of threads per inch in the fabric (*rounded off to the nearest integer*) is _____.
Q.62	In a guarded hot plate, the dimension of the square test plate is 15 cm × 15 cm. Keeping the temperatures of the test plate and the air at 35°C and 20°C, respectively, the power losses from the test plate with and without fabric specimen are 16 W and 40 W, respectively. The intrinsic transmittance [W/(m^2 K)] of the fabric (*rounded off to 2 decimal places*) is _____.
Q.63	A 36 Ne ring spun yarn is produced from 1.2 Ne roving. The total draft and the break draft of the roving frame are 12 and 1.2, respectively. The diameters of back bottom roller, middle bottom roller and front bottom roller of the roving frame are 28 mm, 25 mm and 28 mm, respectively. If the middle bottom roller of the roving frame is eccentric, then the wavelength (m) of the periodic fault in the yarn, neglecting twist contraction, (*rounded off to 2 decimal places*) is _____.
Q.64	A 30 tex cotton yarn is made into a lea of 120 yards for determining CSP. If the lea strength is 500 N, then the CSP of the yarn (*rounded off to the nearest integer*) is _____.

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Q.65	In a continuous scouring operation, a desized fabric (with 40 % wet expression) is dipped into a saturator (alkali bath) before it enters a J-box for scouring. After saturation in the alkali bath, the wet expression increases to 100 %. The required alkali concentration (w/v) of the liquor present in the fabric exiting the saturator is 6 %. Considering no liquor interchange in the saturator, the alkali concentration (w/v) in percentage in the saturator (*in integer*) is _____.

END OF QUESTION PAPER

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