National Council of Science Museums
(Ministry of Culture, Govt. of India)
Block-GN, Sector-V, Bidhan Nagar
Kolkata – 700 091

Aptitude test for selection of Curator 'B'

Name of the Candidate ....

Form no. ....

Date of Aptitude Test: 12/09/2019
Time: 10:30 A.M.

Total Time: 3 Hours

INSTRUCTIONS FOR THE CANDIDATES

01. Please write your name and form number legibly in the spaces provided;

02. The test contains two sections; viz., **Section-'A'** and **Section-'B'**;

03. The duration of the test is 3 hours for both sections and maximum marks are 100;

04. Read the instructions provided with the questions carefully and answer;

05. In questions having multiple choice answers, please tick legibly on the test paper the answer of your choice;

06. In case you need to change your answer, strike out the wrong one legibly and put a tick in the answer of your choice;

07. If more than one answer is ticked, the answer shall be considered invalid and no marks will be awarded for the answer;

08. Carry out your rough work, if any, on the labeled sheet separately provided with this test paper;

09. No mobile phone will be allowed inside the examination hall;

10. There is no negative marking;

11. The complete question paper with labeled attached sheet should be handed over to the instructor before leaving the room;

12. Candidates will not be allowed to leave the examination hall before 2 hours;

*****

Question No. 1 to 30 carry 1 mark each. Tick the correct answer or fill in the blanks with correct alternatives as may be needed in the question.

1. V, W and X are intelligent; V,Y and Z are laborious; Y, X and Z are hones and V, W and Z are ambitious. Which of the following are not laborious?

   a. Y & Z   b. W & X   c. V & W   d. X & Y

2. Fill in the correct option -   UTS : FDC :: WVU : ?

   a. YWV   b. WXY   c. UVW   d. HGF

3. Statement: Should smoking be prohibited?
   Argument I.   Yes, it damages the liver and the lung.
   Argument II.   No, it will drive millions of tobacco workers out of factory.

   a. Only Argument I is strong.   b. Only argument II is strong.
   b. Both the arguments are strong   d. Neither I or II is strong

4. Fill in the correct preposition in the sentence: Trespassers are liable ..... a fine of Rs 500.00.
   a. to   b. for   c. with   d. into

5. The appropriate meaning of the idiom " *plays fast and loose*" is:
   a. very skillful player   b. says one thing and does another
   c. sternly opposed   d. quite worthless

6. Fill in the blank with correct option:

   We need much more proactive and .... supervision of dam waters while releasing in case of overflow to avoid a flood like situation.

   a. punctilious   b. scrupulous   c. diplomatic   d. conforming

7. A person who write the life story of a saint or of another person's life story with only praise and no criticism is called a ....

   a. Chorographer   b. Pragiogrpaher   c. Hagiographer   d. Evangelographer

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8. The word to express 'a long and complicated process that is annoying and seems unnecessary" is:

    a. Legionnaire   b. Rigmarole   c. Roll mop   d. Sacerdotal

9. A person whose natural body shape is thin is called:

    a. Mesomorph   b. Endomorph   c. Ectomorph   d. Entromorph

10. What is the next in the series: 1ZV03X, 3XT11U, 5VR27T, 7TP51R, ………..

    a. 9QM81O   b. 9IM81L   c. 9NR83P   d. 9RN83P

11. If in a secret code DELHI is written as 1817101413, how can NOIDA be written in the same code?

    a. 0708141821   b. 0807131821   c. 1807131822   d. 0807131826

12. India is the largest producer of several food grains. Find the odd man out.

    a. Jute   b. Ginger   c. Onion   d. Banana

13. Every year 12th August is celebrated as International Youth Day. The theme of 2019 International Youth day was:

    a. Transforming the Nation   b. Transforming Education
    c. Transforming Sports   d. Youth Skill and Innovation

14. One of the country below is not a member of Visegrád group or V4 group of countries in central Europe. Identify the country.

    a. Poland   b. Czech Republic   c. Hungary   d. Austria

15. The world is celebrating 150 years of one of the following event. Identify it.

    a. Birth Anniversary Acharya P C Ray   b. Birth Anniversary of Einstein
    c. Periodic Table of Chemical elements   d. Discovery of Radioactivity

16. National Technology Day is celebrated in India on ....

    a. 5th May   b. 28th February   c. 11th May   d. 21st April

17. In a secret artificial language:
    daftafoni means advisement; *imodafta* means misadvise; *imolokti* means misconduct
    Which word could mean "statement"?

    a. *kratafoni*   b. *kratadafta*   c. *loktifoni*   d. *daftaimo*

18. Chandrayaan 1 mission of ISRO which confirmed presence of water molecule on Moon's surface was launched in the year......

    a. 2009   b. 2008   c. 2010   d. 2007

19. The name of the lander, which has been sent by ISRO with the Chandrayaan 2 and which will land at South pole of moon is ....

    a. Vishal   b. Vikrant   c. Vikram   d. Pragyan

20. The Council of Scientific & Industrial Research (CSIR), known for its cutting edge R&D knowledgebase in diverse S&T areas, has a dynamic network of ....
    national laboratories.

    a. 39   b. 42   c. 40   d. 38

21. Government of India scheme of FAME is related to which of the following industry:

    a. Electronics b. Mobile phones c. Electric and hybrid vehicles d. AI, AR & VR

22. The number of elected members in the Upper House of Parliament in India is ....

    a. 250   b. 543   c. 238   d. 545

23. Who is the current Principal Scientific Advisor to the Government of India?

    a. Dr. R. Chidambaram   b. Dr. Anil Kakodkar

    c. Prof. K VijayRaghavan   d. Dr. V.S. Saraswat

24. The large scale physics experiment observatory called LIGO is meant to detect
.........................Radioisotopes which are used in medical diagnosis are known as:

   a. Radioisotopes in Earth's core
   b. Cosmic Gravitational waves
   c. Elements ejected during Solar flare
   d. Magnetic materials in Space

25. The AAYUSH system of medical practice in India consists of several traditional medicine practices. Find the odd man out?

   a. Yoga   b. Unani   c. Ayurveda   d. Accupuncture

26. Here are two statements about the roots of the equation $x2 - 8x + 12 = 0$.
   (i)   The roots are real and rational;   (ii)   The roots are equal
          Which of the following is true?

   a. Neither statement is correct
   b. Only statement (i) is correct
   c. Only statement (ii) is correct
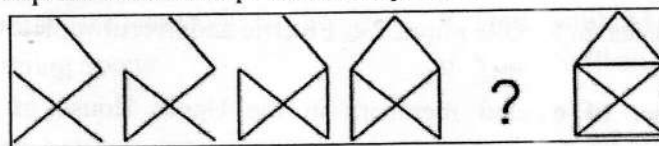   d. Both statements are correct

27. As of now, the total number of states & UTs respectively in India is :

   a. 29 & 7   b. 28 & 9   c. 30 & 6   d. 29 & 9

28. In 2019, DRDO tested its ballistic missile defence interceptor system called ASAT. The name of the mission was:

   a. LAKSHYA   b. NAGA   c. SHAKTI   d. VEDHA

29. Choose the best option which completes the sequence:

   a.   b.   c.   d.

30. India is not a member of which group of countries?

   a. G 7   b. G 20   c. G 5   d. G 4

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Time : 2½ Hours   **Full Marks : 70**

N. B : Answer all questions. Question Nos. 1 through 30 in PART-A carry 1 mark each.
Put tick (√) mark for the correct answer. Question Nos. 1 through 8 in PART-B carry 5
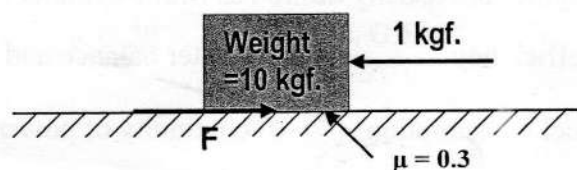*marks each.*

PART – A (Questions in this part carry 1 mark each)

1. An Adjustable Spanner (or a Slide Wrench) is specified by

   a) its length   b) Max. size of the bolt head or nut it can hold

   c) Max. face to face length of the bolt head/nut it can hold   d) none of the above

2. The crowning of pulley is done to

   a) adjust the length of the belt   b) achieve longer life of the pulley

   c) keep the centre line of the belt in position on the pulley rim

   d) increase friction between belt and pulley.

3. In a Micrometer, linear scale accuracy is 1/40 inch. 25 divisions in the thimble corresponds to
   1/40 inch. Measurement of a shaft diameter reads 17 divisions in linear scale and 3 divisions in
   the thimble. The diameter of the shaft is

   a) 0.400 inch   b) 0.425 inch   c) 0.450 inch   d) 0.428 inch

4. A high speed steel tool material is designated as 18-4-1. Its composition is

   a)   18% Nickel, 4% Chromium, 1% Vanadium is present in steel

   b)   18% Chromium, 4% Nickel, 1% Vanadium is present in steel

   c)   18% Tungsten, 4% Chromium, 1% Vanadium is present in steel

   d)   18% Nickel, 4% Chromium, 1% Tungsten is present in steel

5. The number of teeth that can be cut out of a blank diameter of 64 mm for making a CI **spur**
   gear of tooth module 2 is

   a) 24   b) 32   c) 27   d) 30

6. Preheating is essential in welding of

   a) Mild Steel   b) High Speed Steel   c) Cast Iron   d) all non-ferrous materials

7. Automobile engines are usually desired as Multi-cylinder engines because of

   a) high efficiency   b) better balance and uniform torque output

   c) low fuel consumption   d) continuity of power output if one cylinder fails

8. The basic purpose of a flywheel on a rotating machinery is to

    a) allow rapid acceleration.   b) store and release energy as and when required.

    c) balance the rotating parts.   d) control the rotational speed.

9. If T_1 and T_2 be the tension in kg. on tight and slack side of the belt respectively and the speed of the belt is V m/sec, then the power transmitted by the belt in HP is

    a) $(T_1 - T_2)V/4500$ b) $(T_1 - T_2)V/75$ c) $T_1 V/75$ d) $(T_1 - T_2)V/3300$

10. Decibel is a unit to measure

    a) Intensity of Air Pressure   b) Intensity of Light

    c) Intensity of Heat   d) Intensity of Sound

11. A test commonly applied to steel of unknown quality for identification purposes is the

    a) Acid-etch test   b) Spark test   c) Fracture test

    d) Dye penetrant test   e) Impact test

12. Which of the following gears will you use for getting very high speed reduction ratio, Say, 1 : 80 ?

    a) Spur gear   b) Bevel gear   c) Helical gear   d) Worm & worm gear

13. A bullet is fired with a velocity 140 m/s at an angle of projection 30°. The maximum height attained by the bullet is
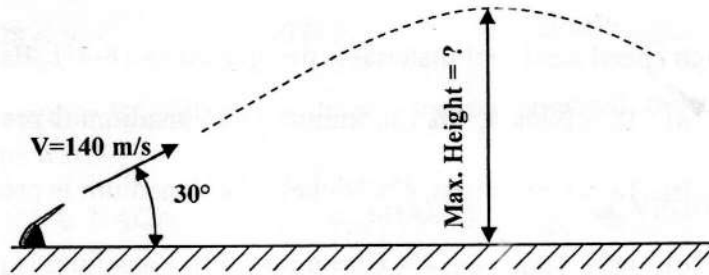

    a) 150 m   b) 200 m   c) 250 m   d) 300 m

14. The most efficient thermodynamic cycle is

    a) Carnot Cycle   b) Sterling Cycle   c) Diesel Cycle   d) Otto Cycle

15. If the total surface area of a cubic block is 216 sq. cm., its volume is

    a) 144 cc.   b) 216 cc   c) 256 cc   d) 296 cc

16. A body of weight 10 kgf. is resting on a rough surface. The coefficient of friction (μ) between the body and the surface is 0.3. When a force of 1 kgf. acts on the body along a direction parallel to the surface, what is the force of Friction (F) acting on the body ?


    a) 3 kgf.   b) 2 kgf.   c) 1.5 kgf.   d) 1 kgf.

17. The maximum efficiency of a mechanical Screw Jack with square threads and friction angle of 30° can be

    a) 100%   b) 50%   c) 33%   d) 25%

18. A long column usually fails by

    a) crushing   b) tension   c) shearing

    d) buckling   e) both crushing & buckling

19. A body having moment of inertia of 30 kg.m^2 is rotating at 210 RPM. It meshes with another body at rest having moment of inertia of 40 kg.m^2. The resultant speed after meshing will be

    a) 90 RPM   b) 100 RPM   c) 80 RPM   d) Insufficient data

20. At a certain moment of time, acceleration of the block A is 2m/s^2 upward and acceleration of the block B is 3m/s^2 upward. The acceleration of the block C is (masses of pulleys and string are negligible)

    a) 5m/s^2 downward   b) 7m/s^2 downward

    c) 8 m/s^2 downward   d) 5m/s^2 upward

21. When a close coiled helical spring is compressed, its wire is subjected to

    a) Tension   b) Shear   c) Compression   d) All of the them

22. The Camshaft of a 4-stroke IC Engine running at 1500 RPM will rotate at

    a) 375 RPM   b) 750 RPM   c) 3000 RPM   d) 6000 RPM

23. Which of the following materials has maximum hardness

    a) Mild Steel   b) Cast Iron   c) Brass   d) Aluminium

24. Which of the following elements is responsible for hardness of steel ?

    a) Carbon   b) Tungsten   c) Nickel   d) Vanadium

25. The pitch of a standard roller chains used in bicycles is

    a) 6.35 mm   b) 12.7 mm   c) 8 mm   d) 18 mm

26. In a Reduction Gearbox, diameter of the output shaft is always more than that of the inp because

   a) Input shaft is connected to the drive motor, hence its size is kept low

   b) Worm gear hub of the gearbox can accommodate bigger shaft than the worm can

   c) Speed at output is reduced; so to transmit the same power, torque at the output shaft is increased. Hence more shaft size is required at the output

   d) It is a customary practice in Gearbox design

27. Rear wheels of a 4-wheeler with differential gear mechanism rotate with 200 RPM each while moving in a straight line. For negotiating a turn with the same linear speed, the left rear wheel is found to rotate with 125 RPM. What is the rotational speed of the right rear wheel and which direction the vehicle is turning ?

   a) 200 RPM, Left   b) 250 RPM, Right   c) 275 RPM, Right   d) 275 RPM, Left

28. A hollow circular cylinder made of GI sheet has an open slant top and open round bottom as shown below (dimensions in mm).
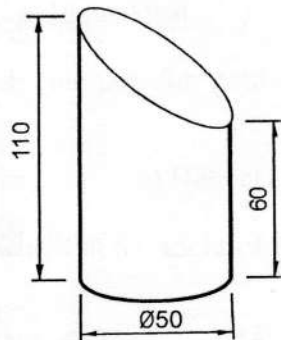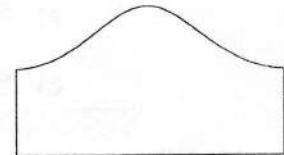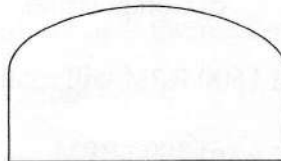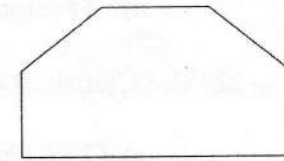

The surface development of its wall will be :

a)
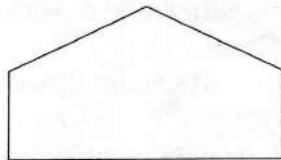
b)

c)

d)

29. Match the mathematical equations in the left with the mathematical figures on the right .

Equations	Figures
$x + y = 50$	Circle
$x^2 + y^2 = 100$	Ellipse
$y^2 = 40x$	Straight line
$4x^2 - 9y^2 = 36$	Hyperbola
$4x^2 + 9y^2 = 36$	Parabola

30. The value of

$$\sqrt{2\sqrt{2\sqrt{2\sqrt{2\sqrt{2\sqrt{2}}}}}} \ldots \ldots \ldots \infty \quad \text{is}$$

a) 1.999   b) 2.999   c) 2   d) 2.222

PART – B   (Questions in this part carry 5 marks each)

1. Write short notes on **any one** of the following topics :

       a. Ergonomics
       b. 3D Printing
       c. Smart Materials

2. Calculate the force F required to be applied on a Flat belt to lift a load of 50 Kgf while the belt passes over a pulley with angle of contact or wrap = 90° (co-efficient of friction between belt and pulley, μ = 0.4) .

3. From a circular sheet of uniform thickness and diameter 104 mm, a triangular lamina of dimension 30 mm, 39 mm & 39 mm is cut off as shown below. Find out the position of the C.G of the remaining sheet with respect to centre O.

4. Two heavy rollers of weights 2W and W are connected by an inextensible string and rest on smooth inclined planes, inclined at 30° and 60° respectively as shown below. Calculate tension in the string and the angle Ø as shown in the figure.
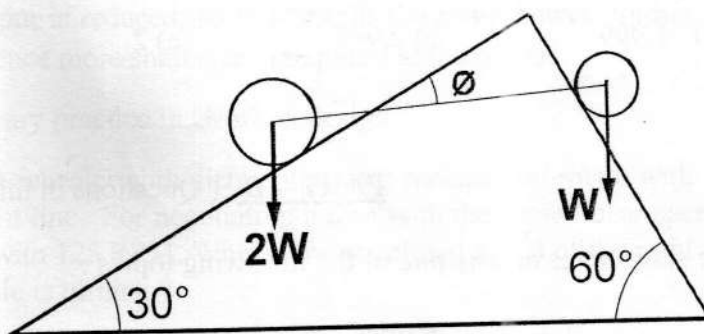

5. Here are two sets of light frictionless pulley systems. One on the left has 1 kg and 2 kg weights at the ends of the pulley rope, while the other has 2 kg and 3 kg weights as shown in the figure. What are the accelerations of the weights in the two systems ?

1 kg   2 kg   2 kg   3 kg
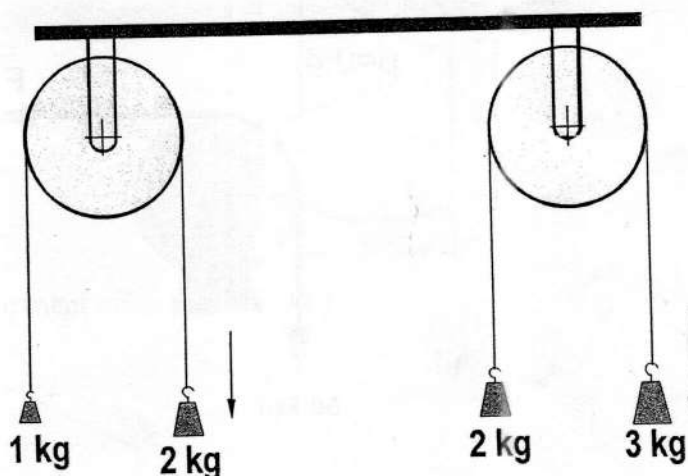
6. In designing a ball roller coaster, it is required to calculate the height from which the ball is to be released so as to pass the loop successfully. Find out the minimum height 'H' for releasing the ball, as shown in the following diagram, so that the ball completes the loop of radius 'r'.
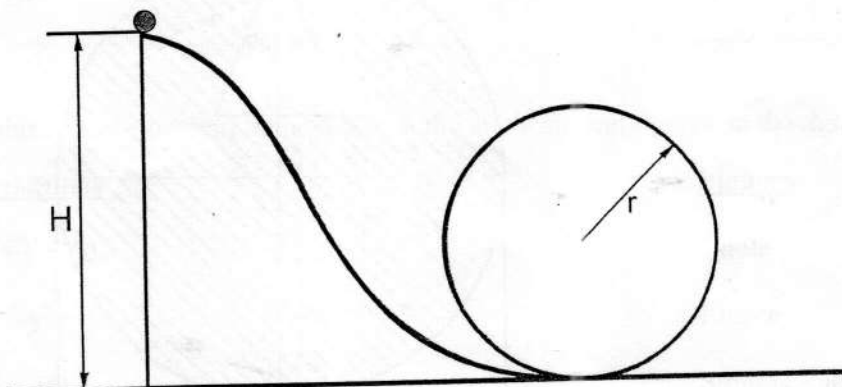
7. In the following gear train, Gear 1 has 54 teeth, Gear 2 has 18 teeth and the Arm A holds their axes to ensure proper meshing. If the Gear 1 is fixed and the Arm A and the Gear 2 are allowed to turn about the axis of Gear 1, find the number of rotations of Gear 2 when the Arm A makes 25 turns.
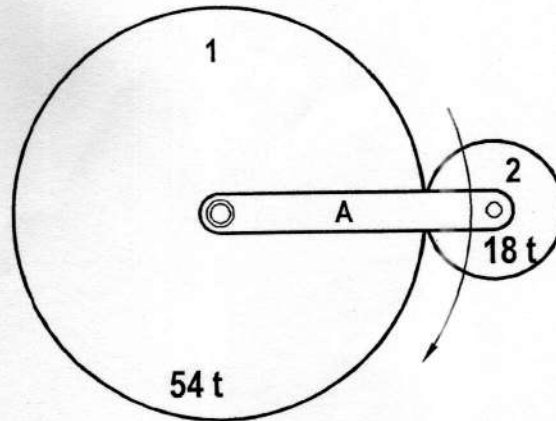
8. In the following stepped pulley system with crossed belt, find the diameters of the pulleys D_2, D_3, d_1, d_2 and d_3 to get speeds of 900, 450 & 75 RPM at the output shaft B from 150 RPM input at shaft A. Diameter $D_1 = 450$ mm.

n_1 = 900 RPM
n_2 = 450 RPM
n_3 = 75 RPM

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