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: 02/11/2018
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;

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NATIONAL COUNCIL OF SCIENCE MUSEUMS
(Ministry of Culture, Government of India)

Marks - 30

Name of the Candidate: **Form No.:**

SECTION - A

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

1. Though many _____ endlessly praised his work, Ramesh often wished for some honest criticism.

   a. sycophants b. pedants c. adversaries d. benefactors

2. The appropriate meaning of the idiom " a dime a dozen" is:

   a. more than sufficient b. something common
   c. the best one d. not so common

3. The Mayor was so _____ by the long trial that, despite his eventual acquittal, he admitted his failing health and declined to run for reelection.

   a. distraught b. exonerated c. inspired d. debilitated

4. Most fans dismissed the press release detailing the comedian's ill health as a hoax, as he had frequently _____ his audience by feigning a physical ailment as part of his stage routine.

   a. reconnoitered b. hoodwinked c. lambasted d. vitiated

5. While the egg of any bird will suffice for the tradition of egg decorating, those with _____ shells are preferred, so as to prevent breaking when their contents are hollowed.

   a. Tenuous b. permeable c. pristine d. resilient

6. The _____ group in the adjoining room made it difficult for students taking the mid-term examination to concentrate.

   a. obstreperous b. quiescent c. rapacious d. enervated

7. Fill the sentence with correct alternative:

   He has _____ appreciation of good poetry.

   a. a little b. the little c. little d. none of these

8. His house is _____ the river Ganges.

a. beside b. besides c. over d. on

9. Based on the following statements and the conclusions, tick mark the correct answer.

Statements: Some towels are brushes. No brush is soap. All soaps are rats.

Conclusions:

I. Some rats are brushes.
II. No rat is brush.
III. Some towels are soaps.

a. None follows b. Only either I or II follows
c. Only II follows d. Only II & III follows

10. The population of Uttar Pradesh is greater than _____ State of India.

a. that of b. that of any c. that of any other d. any other

11. Who has the power to summon and dissolve the Lok Sabha in India?

a. The Prime Minister of India b. The Speaker of the Lok Sabha
c. The President of India d. The Chief Justice of India

12. As per the constitution of India, the number of nominated members by the President of India to the Rajya Sabha, which has the maximum strength of 250 is

a. 16 b. 12 c. 18 d. 14

13. An order from a superior court to a lower court or an administrative authority to perform a certain duty is termed as writ of _____.

a. Mandamus b. Habeas Corpus c. Quo warranto d. Centiorari

14. Noble Prize in Physics 2018 was awarded for groundbreaking work in the field of _____

a. Plasma Physics b. Laser Physics
c. String Theory d. Thermal Physics

15. The Shanti Swarup Bhatnagar prize in the field of S & T in India awarded by CSIR for notable and outstanding research, applied or fundamental in various disciplines of science was first awarded in the year .....

a. 1952 b. 1958 c. 1960 d. 1951

16. 'Param-Ishan' supercomputing facility was launched by Union Govt. in which Indian Institute of Technology (IIT)?

a. IIT Mumbai b. IIT Indore c. IIT Guwahati d. IIT Delhi

17. Total number of states and union territories in India is respectively _____ & _____.

a. 28 & 8 b. 29 & 8 c. 29 & 7 d. 30 & 6

18. The recent successful launch of PSLV by ISRO in Sept 2018 involving two earth observation satellites of M/s Surrey Satellite Technologies Limited (SSTL), United Kingdom was the _____mission of ISRO.

a. PSLV-C40 b. PSLV-C41 c. PSLV-C42 d. PSLV-C43

19. In the recently held Asian Games 2018 in China, India was ranked _____ in the medal's tally.

a. 6 b. 8 c. 7 d. 9

20. The final book of the renowned physicist and bestselling author Stephen Hawking who died in 2018 is titled _____

a. The Brief History of Time b. The Grand Design
c. Brief Answers to Big Questions d. The Universe in a Nutshell

21. A certain jar contains 60 coloured glass marbles – 22 white, 18 green, 11 yellow, 5 red, and 4 purple. If a glass marble is to be chosen at random, what is the probability that the glass marble will be neither red nor purple?

a. 0.09 b. 0.54 c. 0.85 d. 0.91

22. The integers x and y are greater than 1. If $(4x)(7y)=756$, what is the value of $x + y$?

a. 18 b. 12 c. 15 d. 21

23. 18 cups of water by mug A is required to fill a bucket whereas 16 cups of water is sufficient to fill the same bucket by mug B. What is the ratio between volumes of Mug A and Mug B?

a. 16:9 b. 8:9 c. 9:8 d. 4:6

24. Rohan is taller than Anand but shorter than Seema. Krishnan is taller than Pushpa and shorter than Anand. Dhiraj is taller than Krishnan but shorter than Seema. Who among them is the tallest?

a. Rohan b. Anand c. Dhiraj d. Seema

25. The volume V of a right circular cylinder is $V=\pi r^2h$, where r is the radius of the base and h is the height of the cylinder. If the volume of a right cylinder is 45π and its height is 5, what is the circumference of its base?

a. 9 b. 3π c. 6π d. 9π

26. If in a coded language, FLAME is coded as 6121135, then 21215120 is the code for_____

a. VOICE b. BALD c. BLOAT d. CASTLE

27. Of the students in a school, 20 percent are in the science club and 30 percent are in music group. If 25 percent of the students in the school are in the music club and NOT in the science club, what is the percentage of the students which are in science club and NOT in the music club?

a. 25% b. 75% c. 60% d. 20%

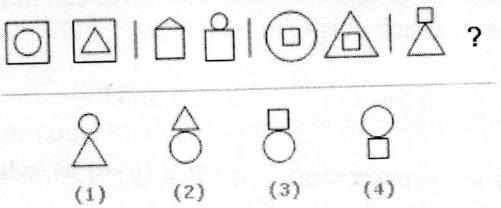
28. The next number in the sequence 3, 6, 9, 30, 117..... is

a. 192 b. 352 c. 388 d. 588

29. In an artificial language, *hapllesh* means cloudburst, *srenchoch* means pinball, and *resbosrench* means ninepin. Which word could mean "cloud nine"?

a. leshsrench b. ochhapl c. haploch d. haplresbo

30. Fill up the missing sequence:



a. 1 b. 2 c. 3 d. 4

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SECTION-B

NATIONAL COUNCIL OF SCIENCE MUSEUMS
KOLKATA
APTITUDE TEST FOR CURATOR (ELECTRONICS ENGINEERING)

Name of the candidate:

Form no.: **Marks: 70**

Answer any 30 Questions by Selecting Right Alternative (30X1 = 30 Marks)

1. Forward voltage drop of a Schottky Diode is
   a. Higher than a standard pn junction diode
   b. Lower than a standard pn junction diode
   c. Equal to a standard pn junction diode
   d. None of the above

2. Lenz's Law is the consequence of the Law of conservation of
   a. Energy
   b. Charge
   c. Field Lines
   d. Momentum

3. Band-gap Energy required to produce Blue light out of an LED is
   a. More than the energy required to produce green light from an LED
   b. More than the energy required to produce red light from an LED
   c. More than the energy required to produce yellow light from an LED
   d. All the above

4. The Electric flux density is a
   a. Scalar quantity
   b. Vector Quantity
   c. Phasor Quantity
   d. None of the above

5. If you increase width of the base region of a BJT keeping doping concentration same
   a. Current gain will Increase
   b. Current gain will remain same
   c. Current gain will decrease
   d. Current gain will exponentially increase

6. Which among the following configurations does not suffer from Miller effect
   a. Common Emitter
   b. Common Collector
   c. Common Base
   d. None of the above

7. Which among the following is the most important consideration in Power Amplifiers?
   a. Collector Efficiency
   b. Biasing the circuit
   c. To Keep the transformer cool
   d. Amplifier distortion

8. The Diodes in a Bridge rectifier each have a maximum PIV rating of 50 Volts. This means the configuration can be used to rectify a signal of maximum
   a. 400 Volts peak to peak
   b. 200 Volts peak to peak
   c. 100 Volts peak to peak
   d. 50 Volts peak to peak

9. In a phase shift oscillator, 180 Degree phase shift is obtained using
   a. Transformer
   b. LC tank Circuit
   c. Three RC Sections
   d. Peak Detector

10. When source voltage increases in a Zener Regulator, which of these currents remain approximately constant
    a. Series Current
    b. Zener Current
    c. Load Current
    d. Total Current

11. Which among the following has a negative resistance region
    a. Opto-coupler
    b. LED
    c. Tunnel Diode
    d. Step recovery Diode

12. A single transistor may be used to design which among the following
    a. NAND Gate
    b. NOR Gate
    c. NOT Gate
    d. OR Gate

13. If 2 transistors having current gain B1 and B2 are connected as Darlington Pair
    a. Overall current gain will be (B1 * B2) / (1 + (B1 * B2))
    b. Overall current gain will be (B1 * B2)
    c. Overall current gain will be (B1 * B2) / (1 - (B1 * B2))
    d. Overall current gain will be (B1 + B2)

14. Self Bias of a JFET produces
    a. Positive Feedback
    b. Negative Feedback
    c. Forward Feedback
    d. Reverse Feedback

15. Which among the following statements is true for a Power MOSFET
    a. It suffers Thermal Runaway because $R_{DS(ON)}$ has positive temperature Coefficient
    b. It suffers Thermal Runaway because $R_{DS(ON)}$ has negative temperature Coefficient
    c. It does not suffer Thermal Runaway because $R_{DS(ON)}$ has positive temperature Coefficient
    d. It does not suffer Thermal Runaway because $R_{DS(ON)}$ has negative temperature Coefficient

16. Silicon Controlled Rectifier used in a crowbar circuit protects the Load
    a. By providing shunt path for excess current to flow through
    b. By providing series path to reduce voltage drop across the Load
    c. Both the above
    d. None of the above

17. In an Operational Amplifier based Integrator, the feedback path consists of
    a. Inductor
    b. Resistor
    c. Capacitor
    d. Cannot be determined

18. Common Mode Rejection Ratio happens to
    a. Be very Low in ideal case
    b. Be very high in ideal case
    c. Be equal to voltage gain
    d. Be equal to Common Mode Voltage Gain

19. Boot-strapping between Inverting and Non-Inverting inputs happens
    a. Because an ideal Operational amplifier has infinite input impedance
    b. Because an ideal Operational amplifier has low output impedance
    c. Because an ideal Operational amplifier has high output impedance
    d. Because an ideal Operational amplifier has low input impedance

20. The Voltage gain of an Operational Amplifier is Unity at the
    a. Cut off Frequency
    b. Unity Gain Frequency
    c. Power Bandwidth
    d. None of the above

21. Binary Equivalent of the Gray coded number 1111 is
    a. 1010
    b. 1011
    c. 1000
    d. 1100

22. Which among the following advantage Excess 3 Code has over 8421 BCD?
    a. BCD code can handle addition of two numbers whose Sum is greater than 9
    b. Excess 3 code can handle addition of two numbers whose Sum is greater than 9
    c. Excess 3 code can handle addition of two numbers whose Sum is less than 9
    d. None of the above

23. Adding Parity bit to a code can help in
    a. Error Detection and Correction both
    b. Error Correction but not Detection
    c. Error Detection but not Correction
    d. Neither Error Detection nor Correction

24. In order to design a 2 input XOR gate using Universal Gates at least
    a. 3 NAND Gates would be necessary
    b. 4 NAND Gates would be necessary
    c. 5 NAND Gates would be necessary
    d. 6 NAND Gates would be necessary

25. A decoder decrypts n bits of information to m bits but a single demultiplexer
    a. Routes n-bits of information among m outputs simultaneously
    b. Routes 1-bit information among any one of the m outputs
    c. Routes n-bits information among any one of the m outputs
    d. Routes m-bits information to 2^moutputs simultaneously

26. Characteristic Equation of a JK Flip Flop is
    a. $Q(t+1) = K(t)Q(t) + J(t)Q'(t)$
    b. $Q(t+1) = K(t)Q(t) + J(t)Q(t)$
    c. $Q(t+1) = K'(t)Q(t) + J(t)Q(t)$
    d. $Q(t+1) = K'(t)Q(t) + J(t)Q'(t)$

27. When other inputs are stable, Propagation Delay in a Flip Flop is defined as
    a. The time instant clock reaches 50% Level to the time the Output reaches 50% Level
    b. The time instant clock reaches 50% Level to the time the Output reaches 100% Level
    c. The time instant clock reaches 100% Level to the time the Output reaches 50% Level
    d. The time instant clock reaches 100% Level to the time the Output reaches 100% Level

28. An Asynchronous counter is slower than a Synchronous Counter because
    a. A flip flop changes state if all preceding flip flops have changed state
    b. Overall propagation delay gets accumulated and ripple through subsequent stages
    c. Both 'a' and 'b'
    d. None of the above

29. For a dual slope A/D Converter the first stage where signal is fed is
    a. An Integrator
    b. A Differentiator
    c. A Clipper
    d. A Counter

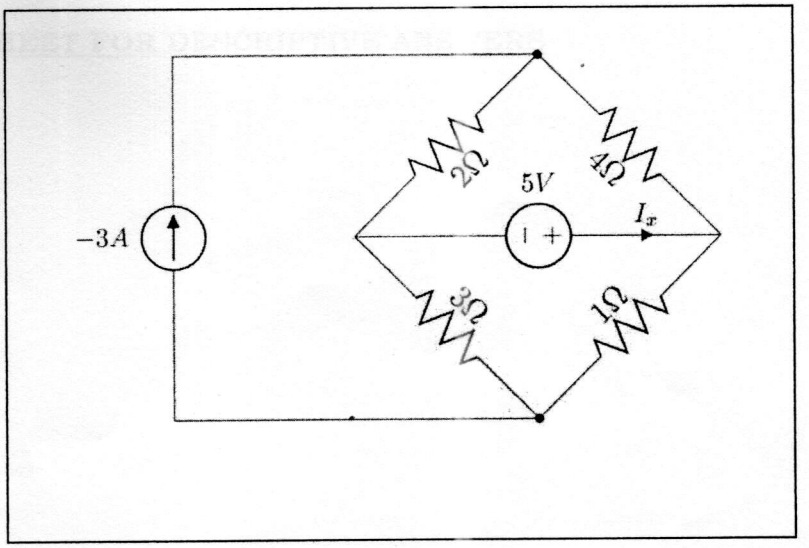
30. Flash memories can retain data even in the absence of power supply because
    a. It has multiple Source in each CMOS Structure
    b. It has multiple Drain in each CMOS Structure
    c. It has multiple Source and Drain in each CMOS Structure
    d. It has a floating Gate apart from the main Gate terminal

31. The ratio of maximum signal strength to the minimum signal strength a Receiver can handle without significant distortion meeting the S/N ratio is called
    a. Sensitivity of the Receiver
    b. Selectivity of the Receiver
    c. Dynamic Range of the Receiver
    d. Noise Figure of the Receiver

32. Which among the following can be used to demodulate FM signal?
    a. A Phase Locked Loop Circuit
    b. A Phase Detector
    c. A Low Pass Filter
    d. None of the above

Part B **Answer all the three questions** **(40 Marks)**

1. Find I_x in the given circuit.



(10 Marks)

2. Write notes on any three of the following:

a. IoT (Internet of Things)

b. GPS and its working principle

c. AI and VR

d. Types of Microcontrollers and their brief applications

(3X5=15 Marks)

3. What are sensors, describe different types of sensors and explain briefly different types of practical applications of the sensors with one detailed explanation with schematics/ circuit and the working principle.

OR

You are told to develop a system to do stock keeping of a warehouse having around 10,000 stocks on an average at any point of time (You may imagine Amazon ware house for example). You need to even track inward flow and outward flow of materials and parcels over the period of time. Propose a design with all necessary details to implement this idea for an automated establishment. You may further propose schemes on top of the basic design to implement e-monitoring of the entire system.

(15 Marks)
