MANAV RACHNA NATIONAL APTITUDE TEST

ENGINEERING(With Maths/Biology)

For all B.Tech, BPT, B.Sc. MLT, B.Sc. Physics, B.Sc.- Maths, Chemistry and B.Sc.-B.Ed Programs(Except B.Tech Lateral)there will be total 75 multiple choice questions comprising of 10 questions of English, 10 questions Logical Reasoning, 10 questions of General Awareness, 15 questions Physics, 15 questions chemistry and 15 Mathematics/Biology(Choose any one section)in the MR-NAT Exam Paper. The student shall be required to solve and answer in 90 minutes. Sample questions for each section are given below:

Section A English

Q1. In the following question, choose the word which best expresses the meaning of the given word "BRIEF".

- a. Limited
- b. Small
- c. Little
- d. Short

Q2. Following question consist of two words which have a certain relationship to each other followed by four pairs of related words, Select the pair which has the same relationship. PAIN:SEDATIVE

- a. comfort: stimulant
- b. grief: consolation
- c. trance: narcotic
- d. ache: extraction

Q3. Choose the correct meaning of the Idiom, "To keeps one's temper"

- a. To become hungry
- b. To be in good mood
- c. To preserve ones energy
- d. To be aloof from
- e. None of these

Q4. In the following question choose the word which is the exact opposite of "ENORMOUS"
- a. Soft
- b. Average
- c. Tiny
- d. Weak

Q5. Choose the synonym of "ABANDON"

a. Try
b. Join
c. Keep with
d. Forsake

Q6. Pick out the most effective word from the given words to fill in the blank to make the sentence meaningful.
"Fate smiles ...... those who untiringly grapple with stark realities of life."
a. With
b. Over
c. On
d. Round

Q7. In the following questions there is one word in which the suffix is wrong. Choose that word:

a. Felicitation
b. Fluctuation
c. Fascination
d. Permition

Q8. In the following words there is one word in which the prefix is wrong. Choose that word:

a. Discooperative
b. Dissatisfaction
c. Disobey
d. Dishonour

Q9. From the given alternatives, choose the one which best expresses the given sentence in Indirect/Direct speech.
She said that her brother was getting married.

a. She said, "Her brother is getting married."
b. She told, "Her brother is getting married."
c. She said, "My brother is getting married."
d. She said, "My brother was getting married."

Q10. Below are given alternatives to the italicised part which may improve the sentence. Choose the correct alternative.
Either he or I am going.

a. he or I are going
b. he is going or I am
c. I or he is going
d. No improvement

Section B Logical Reasoning

Q1. In a chess tournament each of six players will play every other player exactly once. How many matches will be played during the tournament?

    a. 12
    b. 15
    c. 30
    d. 36

Q2. Aruna cut a cake into two halves and cuts one half into smaller pieces of equal size. Each of the small pieces is twenty grams in weight. If she has seven pieces of the cake in all with her, how heavy was the original cake?

    a. 220 gm
    b. 230 gm
    c. 240 gm
    d. 250 gm

Q3. Three of the words will be in the same classification, the remaining one will not be. Choose the odd one out.
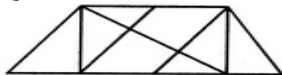
    a. Parsley
    b. basil
    c. dill
    d. mayonnaise

Q4. Complete the series   SCD, TEF, UGH, ____, WKL

    a. CMN
    b. UJI
    c. VIJ
    d. IJT

Q5. A, P, R, X, S and Z are sitting in a row. S and Z are in the centre. A and P are at the ends. R is sitting to the left of A. Who is to the right of P?

    a. A
    b. X
    c. S
    d. Z

Q6. Find the number of triangles in the given figure.

a. 8
b. 10
c. 12
d. 14

Q7.Pointing to a photograph of a boy Suresh said, "He is the son of the only son of my mother."
How is Suresh related to that boy?
a. Brother
b. Uncle
c. Cousin
d. Father

Q8. Choose the pair that best represents a similar relationship to the one expressed in the original
pair of words. MONK : DEVOTION

a. maniac : pacifism
b. explorer : contentment
c. visionary : complacency
d. rover : wanderlust

Q9. Look at this series: 2, 1, (1/2), (1/4), ... What number should come next?

a. 1/3
b. 1/8
c. 2/8
d. 1/16

Q10. Which of the following diagrams indicates the best relationship between Travelers, Train
and Bus?

a.

b.

c.

d.

Section C General Awareness
Q.1 In which state is Shanti Niketan located?
a. Maharashtra
b. West Bengal
c. Karnataka
d. Tamil Nadu

Q.2 Tirupati is located in which state?

a. Tamil Nadu
b. Karnataka
c. Andhra Pradesh
d. Telangana

Q.3 Who is the current Home Minister of India?

a. ArunJaitley
b. Rajnath Singh
c. SushmaSwaraj
d. SmritiIrani

Q.4 Which team won the one-day Cricket World Cup held in the year 2015?

a. New Zealand
b. Australia
c. West Indies
d. India

Q.5 Which among the following is capital of Mizoram?

a. Imphal
b. Dispur
c. Aizwal
d. Shillong

Q.6 The centenary of Mahatma Gandhi's arrival in South Africa was celebrated in

a. May-93
b. Aug-93
c. Jul-93
d. Sep-93

Q.7 The National Song of India was composed by

a. Rabindranath Tagore
b. Bankim Chandra Chatterji
c. Iqbal
d. Jai Shankar Prasad

Q.8 Milkha Singh Stood _____ in 1960 Olympics, in Athletics.

a. fourth in 400m final
b. second in 400m final
c. eighth in 50km walk
d. seventh in 800m final

Q.9 Jaspal Rana is associated with which of the following games?

a. Swimming
b. Archery
c. Shooting
d. Weightlifting

Q.10 Kathak, Nauntanki, Jhora and Kajri are the important dances of

a. Uttaranchal
b. Uttar Pradesh
c. Jharkhand
d. Chhattisgarh

Section D Physics

(1) A planet in a distant solar system is 10 times more massive than the earth and its radius is 10 times smaller. Given that the escape velocity from the earth is 11 kms−1, the escape velocity from the surface of the planet would be

(a) 1.1 kms^{-1}
(b) 11 kms^{-1}
(c) 110 kms^{-1}
(d) 0.11 kms^{-1}

(2) The dimension of magnetic field in M, L, T and C (Coulomb) is given as

(a) $MLT^{-1}C^{-1}$
(b) MT^2C^{-2}
(c) $MT^{-1}C^{-1}$
(d) $MT^{-2}C^{-1}$

(3) Consider a uniform square plate of side 'a' and mass 'm'. The moment of inertia of this plate about an axis perpendicular to its plane and passing through one of its corners is

(a) $4/6\ ma^2$

(b) $3/4\ ma^2$

(c) $2/3\ ma^2$

(d) $1/5\ ma^2$

(4) A body of mass m = 3.513 kg is moving along the x-axis with a speed of 5.00 ms−1. The magnitude of its momentum is recorded as

(a) $17.6\ kg\ ms^{-1}$

(b) $17.565\ kg\ ms^{-1}$

(c) $17.56\ kg\ ms^{-1}$

(d) $17.57\ kg\ ms^{-1}$

(5 A galvanometer of resistance 50 Ω gives a full scale deflection for a current 5×10^{-4} A. The resistance that should be connected in series with the galvanometer to read 3 V is

(a) 5059 Ω

(b) 595 Ω

(c) 5950 Ω

(d) 5050 Ω

(6) An experiment is performed to find the refractive index of glass using a travelling microscope. In this experiment distance are measured by

(a) a vernier scale provided on the microscope

(b) a standard laboratory scale

(c) a meter scale provided on the microscope

(d) a screw gauage provided on the microscope

(7) Two full turns of the circular scale of a screw gauge cover a distance of 1 mm on its main scale. The total number of divisions on the circular scale is 50. Further, it is found that the screw gauge has a zero error of − 0.03 mm while measuring the diameter of a thin wire, a student notes the main scale reading of 3 mm and the number of circular scale divisions in line with the main scale as 35. The diameter of the wire is

(a) 3.32 mm

(b) 3.73 mm

(c) 3.67 mm

(d) 3.38 mm

(8) A bomb of mass 16 kg at rest explodes into two pieces of masses of 4 kg and 12 kg. The

velocity of the 12 kg mass is 4 ms−1. The kinetic energy of the other mass is

(a) 96 J
(b) 144 J
(c) 288 J
(d) 192 J

(9) A particle of mass 100 g is thrown vertically upwards with a speed of 5 m/s. the work done by the force of gravity during the time the particle goes up is

(a) 0.5 J
(b) −0.5 J
(c) −1.25 J
(d) 1.25 J

(10) A electric dipole is placed at an angle of 30° to a non-uniform electric field. The dipole will experience

(a) a torque only
(b) a translational force only in the direction of the field
(c) a translational force only in a direction normal to the direction of the field
(d) a torque as well as a translational force

(11) A material 'B' has twice the specific resistance of 'A'. A circular wire made of 'B' has twice the diameter of a wire made of 'A'. Then for the two wires to have the same resistance, the ratio A / B of their respective lengths must be

(a) 2
(b) 1/2
(c) 4
(d) 1/3

(12) In a region, steady and uniform electric and magnetic fields are present. These two fields are parallel to each other. A charged particle is released from rest in this region. The path of the particle will be a

(a) circle
(b) helix

(c) straight line
(d) ellipse

(13) Needles N1, N2 and N3 are made of a ferromagnetic, a paramagnetic and a diamagnetic substance respectively. A magnet when brought close to them will

(a) attract all three of them
(b) attract N1 and N2 strongly but repel N3
(c) attract N1 strongly, N2 weakly and repel N3 weakly
(d) attract N1 strongly, but repel N2 and N3 weakly

(14) A player caught a cricket ball of mass 150 g moving at a rate of 20 m/s. If the catching process is completed in 0.1 s, the force of the blow exerted by the ball on the hand of the player is equal to

(a) 300 N
(b) 150 N
(c) 3 N
(d) 30 N

(15) A ball of mass 0.2 kg is thrown vertically upwards by applying a force by hand. If the hand moves 0.2 m which applying the force and the ball goes upto 2 m height further, find the magnitude of the force. Consider g = 10 m/s2

(a) 22 N
(b) 4 N
(c) 16 N
(d) 20 N

Section E Chemistry

(1) Toluene is nitrated and the resulting product is reduced with tin and hydrochloric acid. The product so obtained is diazotised and then heated with cuprous bromide. The reaction mixture so formed contains

(a) mixture of o− and p−bromotoluenes

(b) mixture of o– and p–dibromobenzenes
(c) mixture of o– and p–bromoanilines
(d) mixture of o– and m–bromotoluenes

(2) Phenol, when it first reacts with concentrated sulphuric acid and then with concentrated nitric acid, gives

(a) 2,4,6-trinitrobenzene
(b) o-nitrophenol
(c) p-nitrophenol
(d) nitrobenzene

(3) Larger number of oxidation states are exhibited by the actinoids than those by the lanthanoids, the main reason being

(a) 4f orbitals more diffused than the 5f orbitals
(b) lesser energy difference between 5f and 6d than between 4f and 5d orbitals
(c) more energy difference between 5f and 6d than between 4f and 5d orbitals
(d) more reactive nature of the actinoids than the lanthanoids

(4) Which of the following factors is of no significance for roasting sulphide ores to the oxides and not subjecting the sulphide ores to carbon reduction directly?

(a) Metal sulphides are thermodynamically more stable than CS_2
(b) CO_2 is thermodynamically more stable than CS_2
(c) Metal sulphides are less stable than the corresponding oxides
(d) CO_2 is more volatile than CS_2

(5) α-D-(+)-glucose and β-D-(+)-glucose are

(a) conformers
(b) epimers
(c) anomers
(d) enantiomers

(6) Which one of the following is the correct statement?

(a) Boric acid is a protonic acid

(b) Beryllium exhibits coordination number of six
(c) Chlorides of both beryllium and aluminium have bridged chloride structures in solid phase
(d) $B_2H_6.2NH_3$ is known as 'inorganic benzene'

(7) Among the following substituted silanes the one which will give rise to cross linked silicone polymer on hydrolysis is

(a) R_4Si
(b) $RSiCl_3$
(c) R_2SiCl_2
(d) R_3SiCl

(8) In a compound atoms of element Y from ccp lattice and those of element X occupy 2/3rd of tetrahedral voids. The formula of the compound will be

(a) X_4Y_3
(b) X_2Y_3
(c) X_2Y
(d) X_3Y_4

(9) Amount of oxalic acid present in a solution can be determined by its titration with $KMnO_4$ solution in the presence of H_2SO_4. The titration gives unsatisfactory result when carried out in the presence of HCl, because HCl

(a) gets oxidised by oxalic acid to chlorine
(b) furnishes H+ ions in addition to those from oxalic acid
(c) reduces permanganate to Mn^{2+}
(d) oxidises oxalic acid to carbon dioxide and water

(10) Which one of the following pairs of species have the same bond order?

(a) CN^- and NO^+
(b) CN^- and CN^+
(c) O^- and CN^-
(d) NO^+ and CN^+

(11) A reaction was found to be second order with respect to the concentration of carbon monoxide. If the concentration of carbon monoxide is doubled, with everything else kept

the same, the rate of reaction will

(a) remain unchanged
(b) triple
(c) increase by a factor of 4
(d) double

(12) HBr reacts with $CH_2 = CH – OCH_3$ under anhydrous conditions at room temperature to give

(a) CH_3CHO and CH_3Br
(b) $BrCH_2CHO$ and CH_3OH
(c) $BrCH_2 – CH_2 – OCH_3$
(d) $H_3C – CHBr – OCH_3$

(13) The IUPAC name for the complex $[Co(NO_2)(NH_3)5]Cl_2$ is

(a) nitrito-N-pentaamminecobalt (III) chloride
(b) nitrito-N-pentaamminecobalt (II) chloride
(c) pentaamminenitrito-N-cobalt (II) chloride
(d) pentaamminenitrito-N-cobalt (III) chloride

(14) The term anomers of glucose refers to

(a) isomers of glucose that differ in configurations at carbons one and four (C-1 and C-4)
(b) a mixture of (D)-glucose and (L)-glucose
(c) enantiomers of glucose
(d) isomers of glucose that differ in configuration at carbon one (C-1)

(15) Phenyl magnesium bromide reacts with methanol to give

(a) a mixture of anisole and Mg(OH)Br
(b) a mixture of benzene and Mg(OMe)Br
(c) a mixture of toluene and Mg(OH)Br
(d) a mixture of phenol and Mg(Me)Br

Section F Biology(Optional)

Q.1 Which one of the followings belongs to platyhelminthes?

A Plasmodium

B Trypanosoma

C Schistosoma

D Wuchereria

Q.2 Beadle and Tatum showed that each kind of mutant bread mould they studied lacked a specific enzyme. Their experiments demonstrated that

A Cells need specific enzymes in order to function

B Genes are made of DNA

C Genes carry information for making proteins

D Enzymes are required to repair damaged DNA information

Q.3 A compound formed in an organism for inhibiting growth of another organism is

(a) Antigen

(b) Antibody

(c) Antibiotic

(d) Antiallergic

Q.4 Apomictic embryos in citrus arise from

A Maternal sporophytic tissue in ovule

B Synergids

C Diploid egg

D Antipodal cells

Q 5 A fern commonly inoculated to paddy fields is

(a) Azolla

(b) Marsilea

(c) Salvinia

(d) Anabaena

Q6. ATPase enzyme needed for muscle contraction is located in_____.
   a. Actinin
   b. Troponin
   c. Myosin

d. Actin

Q.7 The protein products of the following Bt toxin genes cry IA c and cry II Ab are responsible for controlling

a. Bollworm

b Roundworm

c Moth

d Fruit fly

Q.8 An opiate narcotic is

a Morphine

b LSD

c Amphetamine

d Barbiturate

Q.9 Secretion of osteoid by osteoblasts forms _____.

a Marrow

b Cartilage

c Matrix

d Canaliculi

Q.10 Which of the following hormones promotes the excretion of potassium ions and the reabsorption of sodium ions?

a Aldosterone

b Rennin

c ADH

d None of these

Q.11 A single strand of nucleic acid tagged with a radioactive molecule is called

   a. Plasmid
   b. Probe
   c. Vector
   d. Selectable marker

Q.12 The annular and spirally thickened conducting elements generally developed in the protoxylem when the root or stem is

 a. Elongating

 b. Maturing

 c. Differentiating

d. Widening

Q.13 Which one of the following pairs, is not correctly matched?
a. IAA – Cell wall elongation
b Abscisic acid – Stomatal closure
c Gibberellic acid – Leaf fall
d Cytokinin – Cell division

Q.14 Guard cells help in
   a. Transpiration
   b. Protection against grazing
   c. Fighting against infection
   d. Guttation

Q.15 Cultivation of fishes in artificially prepared ponds or water bodies is called
a. Aquaculture
b. Pisciculture
c. Vermiculture
d. Agriculture

Section F Mathematics(Optional)

   (1) Three houses are available in a locality. Three persons apply for the houses. Each applies
   for one house without consulting others. The probability that all the three apply for the
   same house is

   (a) 5/9
   (b) 1/9
   (c) 8/9
   (d) 4/9

   (2) A lizard, at an initial distance of 21 cm behind an insect, moves from rest with an
   acceleration of 2 cm/s2 and pursues the insect which is crawling uniformly along a
   straight line at a speed of 20 cm/s. Then the lizard will catch the insect after

   (a) 19 s
   (b) 1 s
   (c) 21 s

(d) 25 s

(3) If both the roots of the quadratic equation $x^2 - 2kx + k^2 + k^{-5} = 0$ are less than 5, then k lies in the interval

(a) (5, 6]
(b) (6, ∞)
(c) (-∞, 4)
(d) [4, 5]

(4) A plane passes through $(1, -2, 1)$ and is perpendicular to two planes $2x - 2y + z = 0$ and $x - y + 2z = 4$. The distance of the plane from the point $(1, 2, 2)$ is

(a) 0
(b) 2
(c) Square Root of 3
(d) 2 Square Root of 2

(5) A tangent drawn to the curve $y = f(x)$ at $P(x, y)$ cuts the x-axis and y-axis at A and B respectively such that BP : AP = 3 : 1, given that $f(1) = 1$, then

(a) equation of curve is x dy/dx - 3y = 0
(b) normal at (1, 1) is $x + 3y = 4$
(c) curve passes through (2, 1/8)
(d) equation of curve is x dy/dx + 3y = 0
(6) Suppose a population A has 100 observations 101, 102, … , 200, and another population B has 100 observations 151, 152, … , 250. If VA and VB represent the variances of the two populations, respectively, then VA/VB is

(a) 1
(b) 9/4
(c) 4/9
(d) 2/3

(7) The number of values of x in the interval $[0, 3\pi]$ satisfying the equation $2\sin 2x + 5\sin x - 3 = 0$ is

(a) 4
(b) 6

(c) 1

(d) 2

(8) 125 gallons of a mixture contains 20% water. What amount of additional water should be added such that water content be raised to 25%?

a. 15/2 gallons.

b. 17/2 gallons

c. 19/2 gallons

d. 8.3 gallons.

(9) A particle has two velocities of equal magnitude inclined to each other at an angle θ. If one of them is halved, the angle between the other and the original resultant velocity is bisected by the new resultant. Then θ is

(a) 90°

(b) 120°

(c) 45°

(d) 60°

(10) A body falling from rest under gravity passes a certain point P. It was at a distance of 400 m from P, 4s prior to passing through P. If $g = 10$ m/s^2, then the height above the point P from where the body began to fall is

(a) 720 m

(b) 900 m

(c) 320 m

(d) 680 m

11) A straight line through the point A(3, 4) is such that its intercept between the axes is bisected at A. Its equation is

(a) x + y = 7

(b) 3x − 4y + 7 = 0

(c) 4x + 3y = 24

(d) 3x + 4y = 25

(12) In an ellipse, the distance between its foci is 6 and minor axis is 8. Then its eccentricity is

(a) 3/5

(b) 1/2
(c) 4/5
(d) 7

(13) The function $f(x) = x/2 + 2/x$ has a local minimum at

(a) $x = 2$
(b) $x = -2$
(c) $x = 0$
(d) $x = 1$

(14) The set of points where $f(x) = x / 1+|x|$ is differentiable is

(a) $(-\infty, 0) \cup (0, \infty)$
(b) $(-\infty, -1) \cup (-1, \infty)$
(c) $(-\infty, \infty)$
(d) $(0, \infty)$

(15) At an election, a voter may vote for any number of candidates, not greater than the number to be elected. There are 10 candidates and 4 are of be elected. If a voter votes for at least one candidate, then the number of ways in which he can vote is

(a) 5040
(b) 6210
(c) 385
(d) 1110