Reg. No. | | | | | | | | | | | |

BSCPHCN 502

Fifth Semester B.Sc. Degree Examination, Dec. 2023/Jan. 2024
(NEP 2020) (2023-2024 Batch Onwards)
PHYSICS (DSCC)
Elements of Atomic, Molecular and Laser Physics

Time : 2 Hours | Max. Marks : 60

Instructions : *1) Answer questions from **all** Parts.*
*2) **Scientific** calculators are allowed.*

PART – A

Answer **any four** questions. **Each** question carries **2** marks : **(2×4=8)**

1. What are the limitations of Bohr atom model ?
2. What are excitation and ionization potentials ?
3. Write an expression for Bohr-magneton and write its unit.
4. What is Stark effect ? Explain.
5. What is Phosphorescence ? Give an example.
6. Write any two properties of a LASER beam.

PART – B

Answer **all** questions : **(10×4=40)**

Unit – I

7. a) Derive an expression for the energy of the electron in an orbit by assuming the radius of the electron orbit. **4**

   b) Discuss the special features of Sommerfeld atom model and mention the condition for allowed elliptical orbits. **6**

OR

8. a) Write a note on spectral series of hydrogen atom. **4**

   b) Describe the *Franck*-Hertz experiment with a diagram. **6**

P.T.O.

Unit – II

9. a) Explain magnetic moment due to orbital motion of an electron. **4**

   b) Discuss the theory of the Stern-Gerlach experiment and obtain an expression for the vertical deflection of atomic beam. **6**

OR

10. a) Explain the fine structure of spectral lines for Sodium using the energy level diagram. **4**

    b) Explain the various Quantum numbers associated with Vector atom model. **6**

Unit – III

11. a) Mention the order of energy of various regions of molecular spectra. **4**

    b) Obtain an expression for the rotational energy of a diatomic molecule and wave number of rotational spectra assuming it to be a rigid rotator. **6**

OR

12. a) Give the Quantum theory of Raman effect. **4**

    b) Explain the theory of a vibrating molecule as a simple harmonic oscillator. **6**

Unit – IV

13. a) Explain Spontaneous emission, Stimulated absorption and Stimulated emission with required energy level diagram. **4**

    b) Explain the construction and working of Ruby laser. **6**

OR

14. a) What are three level and four level lasers ? Give one example each. **4**

    b) Explain the construction and working of He-Ne laser. **6**

PART – C

15. Answer **any three** questions. **Each** question carries **4** marks : **(4×3=12)**

    a) Calculate longest and shortest wavelength of Balmer series.

    b) The most prominent Calcium line has wavelength 4226×10^{-10}m. Calcium atoms exhibit Normal Zeeman effect in a magnetic field of 4T. Calculate the wavelength of component lines and the separation between them.

    c) With an exciting radiation of wavelength 589 nm, a substance showed a Raman line at a wavelength of 600.2 nm. Find the wavelength and frequency of Stokes and anti-Stokes lines.

    d) The output power of the laser is 1mW for the emitted wavelength of 630 nm. Find the number of photons emitted per second.

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BSCPHCN 501

Fifth Semester B.Sc. Examination, Dec. 2023/Jan. 2024
(NEP – 2020) (2023 – 2024 Batch Onwards)
PHYSICS (DSCC)
Classical Mechanics and Quantum Mechanics

Time : 2 Hours Max. Marks : 60

Instructions : *i) Answer questions from **all** Parts.*
*ii) **Scientific** calculators are **allowed.***

PART – A

I. Answer **any four** of the following. **(4×2=8)**

1) Distinguish between inertial and non-inertial frames of reference.
2) Give the comparison between scleronomous and rheonomous constraints.
3) Give the expressions for D'Alembert's principle both in differential and integral forms.
4) Using suitable expression explain in brief the Hamiltonian of a system.
5) With an equation, explain Einstein's photo-electric effect.
6) Give equation of continuity and its physical significance.

PART – B

II. Answer **one full** question from **each** unit by availing the internal choice. **(10×4=40)**

Unit – I

7) a) What are generalized coordinates ? Deduce principle of virtual work. **4**
b) Derive Newton's equation of motion from Lagrange's equation of motion of a particle. **6**

OR

8) a) What is meant by conservative force ? State and equate conservation of angular momentum and conservation of energy. 4

b) Using suitable steps derive Lagrange's equation of motion for conservative holonomic system. 6

Unit – II

9) a) Write the fundamental properties of Poisson's brackets. 4

b) Deduce Hamilton's principle for a holonomic system. 6

OR

10) a) Deduce Hamilton's equation of motion from Hamiltonian of a system. 4

b) Deduce Lagrange's equation of motion from Hamilton's principle. 6

Unit – III

11) a) Derive expression for de-Broglie wavelength in terms of momentum, kinetic energy, potential and temperature. 4

b) Give the experimental evidence for matter wave by Davisson-Germer experiment. 6

OR

12) a) Derive a relation between group and phase velocities. 4

b) Derive an expression for Compton shift. 6

Unit – IV

13) a) Give the postulates of quantum mechanics. 4

b) Derive wave equation for a particle in one dimensional infinite potential box. 6

OR

14) a) Explain degeneracy of a particle in three-dimensional infinite potential box. 4

b) Derive Schrodinger's time independent wave equation. 6

PART – C

III. Answer **any three** questions. **(3×4=12)**

15) a) Lagrangian for the oscillating simple pendulum is $L = T - V = \frac{1}{2}ml^2\dot{\theta}^2 - mgl(1-\cos\theta)$. If the force is conservative, obtain an equation for motion of a simple pendulum and hence determine angular acceleration $(\ddot{\theta})$ for g = 9.8 ms^{-2}, l = 50 cm and $\theta = 90°$.

b) Lagrangian of a harmonic oscillator is $L(x) = \frac{1}{2}m\dot{x}^2 - \frac{1}{2}kx^2$. Find :

i) Hamiltonian of the system

ii) Equation of motion in Hamiltonian form ($\dot{x}$ and $\dot{P}_x$).

c) An X-ray beam of energy 0.01 MeV is reflected at the (100) plane of a certain crystal having inter atomic spacing of 0.314 nm. Calculate the glancing angle at which the first order Bragg's spectrum will be observed.

d) Calculate the first three permitted energy levels of electron, in a box of 1Å wide.

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BSCMTCN 502

V Semester B.Sc. Degree Examination, December 2023/January 2024
(NEP 2020) (2023-24 Batch Onwards)
MATHEMATICS
Algebra and Graph Theory

Time : 2 Hours | Max. Marks : 60

Instructions : *1) Answer **any ten** questions from Part – **A**. **Each** question carries **2** marks.*

*2) Answers to Part – **A** should be written in the **first few** pages of the answer book before answers to Part – **B**.*

*3) Answer **any eight** questions from Part – **B**, choosing **two** questions from **each** Unit. **Each** question carries **5** marks.*

*4) **Use** of scientific calculator is **permitted**.*

PART – A

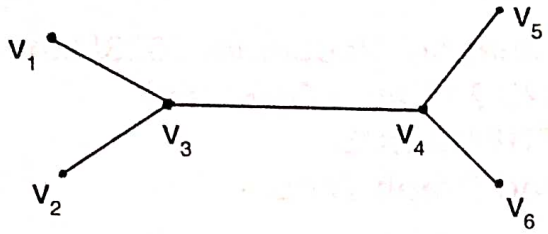
Answer **any ten** questions. **(10×2=20)**

1. If G is a finite group and $a \in G$ then prove that $a^{O(G)} = e$.
2. If N is a normal subgroup of G then prove that $gNg^{-1} = N$, $\forall\ g \in G$.
3. If ϕ is a homomorphism of G into $\overline{G}$ then prove that $\phi(x^{-1}) = (\phi(x))^{-1}\ \forall\ x \in G$.
4. Determine whether the permutation (1,2,3)(4,5) is even or odd.
5. Define the zero divisors in a ring.
6. Find the kernel $I(\phi)$ for the homomorphism $\phi : R \to R$ defined by $\phi(x) = x$, for all $x \in R$.
7. If U is an ideal of R and $1 \in U$ then prove that $U = R$.
8. Prove that the number of odd degree vertices in a graph is even.

P.T.O.

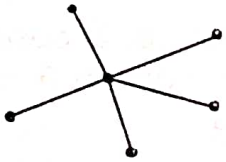
9. Define a complete graph. Give an example.

10. Find the centre of the graph.



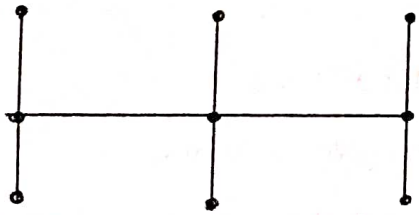
11. Define :
    i) Edge connectivity
    ii) Vertex connectivity in a graph.

12. Write the chromatic polynomial of following graph.

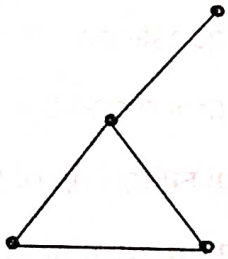


13. Write the chromatic number of following graphs.

i)



ii)



14. Define :
    a) Proper coloring
    b) Chromatic number of a graph.

PART – B

Answer **any eight** questions by choosing **two** questions from **each** Unit. **(8×5=40)**

UNIT – I

15. State and prove Lagrange's theorem on finite groups.

16. Prove that N is a normal subgroup of G if and only if every left coset of N in G is again a right coset of N in G.

17. If G and $\overline{G}$ are any two groups then prove that a homomorphism $\phi : G \to \overline{G}$ is one-one if and only if $\ker\phi = \{e\}$.

18. If ϕ is a homomorphism of a group G onto a group $\overline{G}$ with the kernel K, then prove that $\frac{G}{K} \cong \overline{G}$.

UNIT – II

19. Prove that every finite integral domain is a field.

20. Prove that only ideals of a field F are {0} and F itself.

21. If U and V are ideals of a ring R then prove that $U + V = \{u + v | u \in U, v \in V\}$ is an ideal of R.

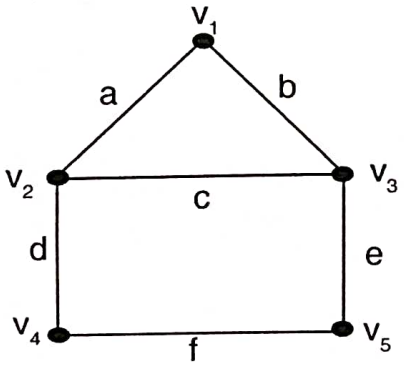
22. Prove that an ideal M of a ring R is maximal if R/M is a field.

UNIT – III

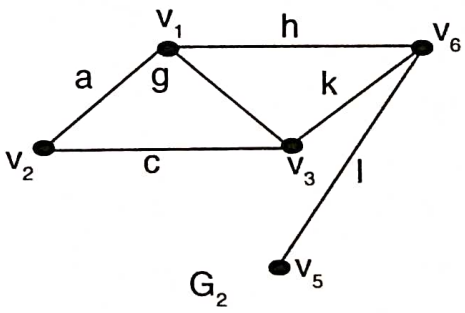
23. Prove that a simple graph with n vertices and k components can have atmost $\frac{(n-k)(n-k+1)}{2}$ edges.

24. Given two graphs G_1 and G_2, find :

i) $G_1 \cup G_2$ ii) $G_1 \cap G_2$ iii) $G_1 \oplus G_2$



G_1



G_2

25. Prove that a tree with n vertices has (n – 1) edges.

26. If a graph has exactly two vertices of odd degree, then show that there must be a path joining these two vertices.

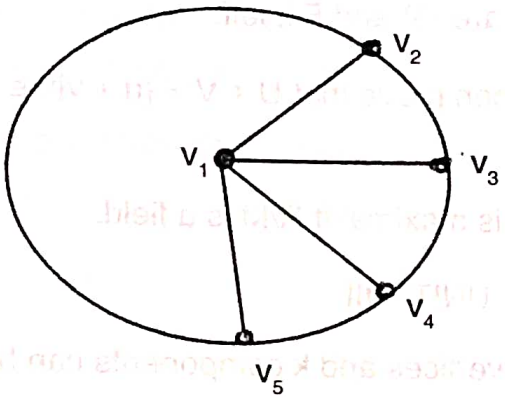
UNIT – IV

27. Prove that Kuratowski's first graph K_5 is nonplanar.

28. Prove that a connected planar graph with n vertices and e edges has e – n + 2 regions.

29. Prove that the chromatic polynomial of an n vertex tree is $P_n(\lambda) = \lambda(\lambda - 1)^{n-1}$.

30. Find the chromatic polynomial of the graph.



Reg. No. | | | | | | | | | | | |

BSCMTCN 501

V Semester B.Sc. Degree Examination, December 2023/January 2024
(NEP 2020) (2023 – 24 Batch Onwards)
MATHEMATICS
Real Analysis II and Complex Analysis

Time : 2 Hours | Max. Marks : 60

Instructions : *1) Answer **any ten** questions from Part – **A**. **Each** question carries **2** marks.*
*2) Answers to Part – **A** should be written in the **first few** pages of the answer book before answers to Part – **B**.*
*3) Answer **any eight** questions from Part – **B**, choosing **two** questions from **each** Unit. **Each** question carries **5** marks.*
*4) **Use** of scientific calculator is **permitted**.*

PART – A

Answer **any ten** questions. **(10×2=20)**

1. Find the lower sum L(P, f) for the function f(x) = 3 – 4x on [1, 8] with partition P = {1, 4, 6, 8}.

2. Show that the function f defined by $f(x) = \begin{cases} 0, & \text{when x is rational} \\ 1, & \text{when x is irrational} \end{cases}$ is not integrable on any interval.

3. Show that the function $f(x) = \begin{cases} k, & \text{a positive constant when } x \neq 0 \\ 0, & \text{when } x = 0 \end{cases}$ is integrable on [– 1, 1].

4. Using the Gamma function, evaluate $\int_0^\infty x^3 e^{-x}\, dx$.

5. Using direct comparison test, show that $\int_1^\infty \frac{\sin^2 x}{x^2} dx$ converges.

6. Evaluate $\int_0^3 \frac{dx}{x-1}$.

7. Prove that the beta function is symmetric.

P.T.O.

8. Find the domain of $f(z) = \frac{z}{z + \bar{z}}$.

9. Find the principal argument Arg Z when $Z = \frac{i}{-2 - 2i}$.

10. If $f(z) = z^2$, then prove that $f'(z) = 2z$.

11. Determine the singular points of the function $f(z) = \frac{z^3 + i}{z^2 - 3z + 2}$.

12. Evaluate $\int_1^2 \left(\frac{1}{t} - i\right)^2 dt$.

13. Evaluate $\int_0^{3+i} z^2 \, dz$ along the line $3y = x$.

14. By finding an antiderivative, evaluate the integral $\int_0^{\pi+2i} \cos\left(\frac{z}{2}\right) dz$, where the path is any contour between $(0, \pi + 2i)$.

PART – B

Answer **any eight** questions by choosing **two** questions from **each** Unit. **(8×5=40)**

Unit – I

15. Show that x^2 is integrable on any interval [0, k].

16. Prove that a bounded function f is integrable on [a, b] if and only if for every $\varepsilon > 0$, there exists a partition P of [a, b] such that $U(P, f) - L(P, f) < \varepsilon$.

17. Using Riemann sum, compute $\int_1^2 f(x) \, dx$, where $f(x) = 3x + 1$.

18. Prove that $f(x) = 1 - x^2$ is Riemann integrable on [0, 1] and show that $\int_0^1 f(x) \, dx = \frac{2}{3}$.

Unit – II

19. Evaluate $\int_1^2 \frac{ds}{s\sqrt{s^2 - 1}}$.

20. Evaluate $\int_2^\infty \frac{x + 3}{(x - 1)(x^2 + 1)} dx$.

21. Show that $\frac{\Gamma\left(n+\frac{1}{2}\right)}{\Gamma(n+1)} = \frac{1.3.5.... (2n-1)}{2.4.6....2n}\sqrt{\pi}$.

22. Show that $\int_0^1 x^5(1-x^3)^{10}\, dx = \frac{1}{396}$.

Unit – III

23. Find all the roots of $(-16)^{\frac{1}{4}}$ in rectangular co-ordinates.

24. Let $f(z) = u(x, y) + i\, v(x, y)$ be a function of $z = x + iy$, $z_0 = x_0 + iy_0$ and $w_0 = u_0 + iv_0$. Then prove that $\lim_{z \to z_0} f(z) = w_0$ if $\lim_{(x, y) \to (x_0, y_0)} u(x, y) = u_0$ and $\lim_{(x, y) \to (x_0, y_0)} v(x, y) = v_0$.

25. Show that $f(z) = \overline{z}$ is nowhere differentiable.

26. Using Cauchy-Riemann equations (in polar form), show that for the function $f(z) = \frac{1}{z}$, $f'(z)$ exists when $z \neq 0$.

Unit – IV

27. If a function $f(z) = u(x, y) + iv(x, y)$ is analytic in a domain D, then show that its component functions u and v are harmonic in D.

28. Show that the function $u(x, y) = 2x - x^3 + 3xy^2$ is harmonic and find a harmonic conjugate $v(x, y)$.

29. Evaluate $\int_C f(z)\, dz$ where $f(z) = z - 1$ and C is the arc from $z = 0$ to $z = 2$ consisting of the semicircle $z = 1 + e^{i\theta}$ $(\pi \leq \theta \leq 2\pi)$.

30. Evaluate $\int_C \frac{z}{(z^2+1)(z^2-9)}\, dz$ where C is the circle $|z| = 2$.

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COMESSN 501

Fifth Semester B.A./B.Sc./B.Com./B.B.A./B.C.A./ B.S.W. and All Other UG Programmes Examination, December 2023/January 2024 (NEP 2020) (2023-24 Batch Onwards) EMPLOYABILITY SKILLS

Question Booklet Sl. No.
512798

Time : 2 Hours

Max. Marks : 60

Instructions : *1) Answer **all** questions.*
*2) **Each** question carries **one** mark.*
*3) **Only** simple calculators are allowed.*
*4) Answers should be shaded by dark circles using **blue/ black** ball point pen in the **Response** sheets provided.*

1. Find the next number in the following series 3, 6, 12, 24, _____.

   A) 72 B) 36 C) 48 D) 45

2. Find the missing number in the following series 2, 3, 7, 16, 32, 57, 93, ?, 206.

   A) 125 B) 142 C) 136 D) 140

3. The least number to be subtracted from 1000 so that the new number is divisible by 23 is

   A) 977 B) 12 C) 1 D) 11

4. If the number 136M425 is divisible by 9 then value of M is

   A) 4 B) 3 C) 1 D) 6

5. Find least number exactly divisible by 12, 15, 20 and 27.

   A) 54 B) 540 C) 12 D) 270

P.T.O.

6. HCF and LCM of two numbers are 3 and 60. One number is 12. The other number is

A) 5 B) 20 C) 15 D) 120

7. Find the smallest number by which 396 must be multiplied so that product becomes a perfect square.

A) 2 B) 11 C) 3 D) 5

8. Simplify $\sqrt[3]{0.008} + \sqrt[3]{0.125}$.

A) 0.07 B) 0.007 C) 0.7 D) 7

9. Simplify $((3)^2)^3 \div (\sqrt{3})^4$.

A) 81 B) 3 C) 9 D) 27

10. An accurate clock shows 8 O'clock in the morning. Through how many degrees will the hour hand rotate when the clock shows 2 O'clock in the afternoon ?

A) 144° B) 150° C) 168° D) 180°

11. If Independence day in 2023 was on Tuesday, then Independence day in 2025 falls on

A) Wednesday B) Thursday

C) Friday D) Saturday

12. Rent of a house is increased from Rs. 7,000 to Rs. 7,700. Express the increase in price as a percentage of the original rent.

A) 7% B) 17%

C) 20% D) 10%

13. A shopkeeper made a profit of 20% on cost of an article which is sold for ₹ 2400. The cost price of the article is

A) ₹ 2,000 B) ₹ 2,200

C) ₹ 2,600 D) ₹ 2,800

14. Find the interest to be paid on a loan of Rs. 3000 at simple interest of 5% per year for 5 years.

A) Rs. 150 B) Rs. 570

C) Rs. 750 D) Rs. 7,500

15. Find the compound interest on Rs. 20,000 at 6% rate of interest p.a. for 2 years.

A) Rs. 2,472 B) Rs. 22,274

C) Rs. 2,400 D) Rs. 4,800

16. If Rs. 2,700 is divided among three persons A, B, C in the ratio 2 : 3 : 4, then B's share is

A) Rs. 600 B) Rs. 300

C) Rs. 1,200 D) Rs. 900

17. The sum of two numbers is 60 and their difference is 6. What is the ratio of two numbers ?

A) 10 : 1 B) 11 : 9

C) 3 : 11 D) 1 : 10

18. A takes 8 days and B takes 10 days to complete a job. How much time is required to complete the work together ?

A) 40/9 days B) 9/40 days

C) 18 days D) 9 days

19. 5 men prepare 10 toys in 6 days working 6 hrs. a day. How many days can 12 men prepare 16 toys working 8 hrs. in a day ?

A) 6 days
B) 9 days
C) 3 days
D) 2 days

20. Two pipes A and B can separately fill a tank in 36 hours and 45 hours respectively. If both the pipes are opened simultaneously, how much time will be taken to fill the tank ?

A) 10 hours
B) 12 hours
C) 15 hours
D) 20 hours

21. A train starts from a place A at 6 a.m. and arrives at another place B at 4.30 p.m. on the same day. If the speed of the train is 40 km per hour, find the distance travelled by the train.

A) 400 km
B) 320 km
C) 230 km
D) 420 km

22. A man riding his bicycle covers 150 metres in 25 seconds. What is his speed in km per hour ?

A) 20
B) 23
C) 21.6
D) 25

23. A train 100 m long is running at the speed of 36 km/hr. Find the time taken by the train to pass a man standing near the railway line.

A) 10 sec.
B) 5 sec.
C) 20 sec.
D) 25 sec.

24. A car driver leaves Bangalore at 8.30 A.M. and expects to reach a place 300 km from Bangalore at 12.30 P.M. At 10.30 A.M. he finds that he has covered only 40% of the distance. By how much he has to increase the speed of the car in order to keep up his schedule ?

A) 30 km/hour
B) 35 km/hour
C) 40 km/hour
D) 45 km/hour

25. The speed of a boat when travelling down stream is 32 km/hr, where as when travelling upstream is 28 km/hr. What is the speed of the boat in still water ?

A) 14 km/hr B) 30 km/hr C) 10 km/hr D) 60 km/hr

26. A man can row 7.5 km/hr in still water. If in a river, speed of the stream is 1.5 km per hour, what is the downstream speed ?

A) 6 km/hr B) 3 km/hr C) 9 km/hr D) 4.5 km/hr

27. In how many different ways can the letters of the word 'MOBILE' be arranged ?

A) 6 B) 360 C) 120 D) 720

28. In how many ways can a cricket team of eleven be chosen out of 14 players ?

A) 634 B) 364 C) 346 D) 463

29. In how many ways can 5 girls be a seated in a bench ?

A) 120 B) 5 C) 6 D) 20

30. When an unbiased die is tossed, the probability of getting multiple of 3 is

A) $\frac{2}{3}$ B) $\frac{1}{2}$

C) $\frac{1}{3}$ D) 1

31. If in a certain code language, TWENTY is coded as 863985 and ELEVEN is coded as 323039, how will TWELVE be coded ?

A) 863903 B) 863658

C) 863203 D) 683583

32. Find the missing term of the series BF, CH, ?, HO, LT.

A) FG B) EK C) CE D) FJ

33. Find the next term of the series 30, 42, 56, 72, ___.

A) 80 B) 110 C) 90 D) 82

34. M, N, O, P, R are sitting together. P is at extreme right. N is to the immediate left to O. R is in between M and N. Who is sitting to the left to P ?

A) M B) R C) N D) O

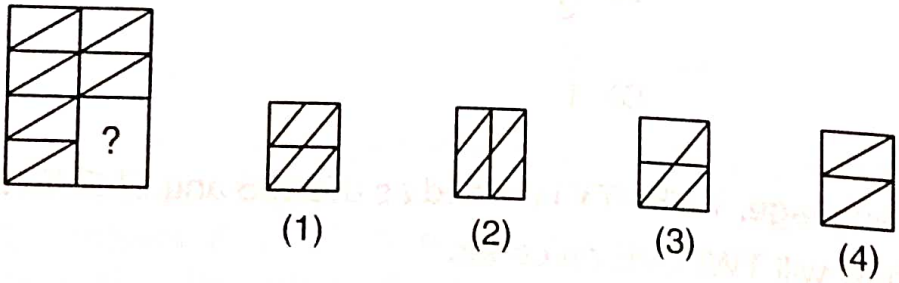
35. From the following, choose the alternative that correctly represents the water image of the word NUCLEAR.

1. ЯAƎЛCUИ
2. ИИCЛƎAЯ
3. ИUCЛƎAЯ
4. ИИCЛEAЯ

A) 1 B) 2

C) 3 D) 4

36. Identify the figure that completes the pattern.

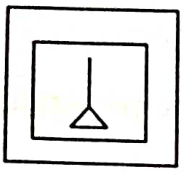


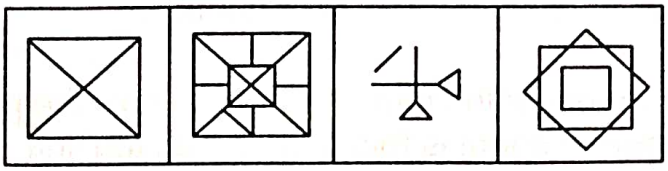
A) 1 B) 2

C) 3 D) 4

37. Find out the answer figure in which the given question figures is embedded.

Question Figure Answer Figures



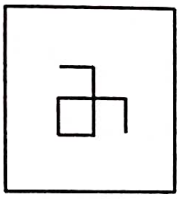


(a) (b) (c) (d)

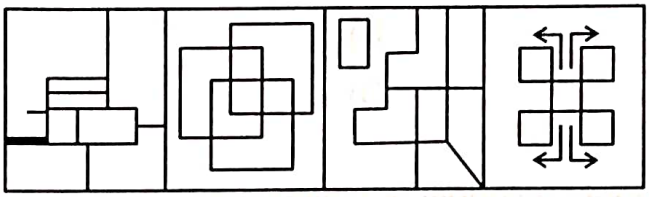
A) a B) b

C) c D) d

38. Find out the alternative figure which contains figure (X) as its part.



(X)



(1) (2) (3) (4)

A) 1 B) 2

C) 3 D) 4

39. Choose the alternative which is closely resembles the mirror-image of the given combination.

ANS43Q12

1. AИSϤƐOIS
2. SIOƐϤSИA
3. SИAƐϤOSI
4. ISOϤƐAИS

A) 1 B) 2

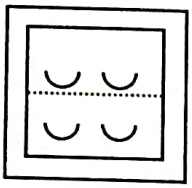
C) 3 D) 4

40. Bank : Interest : : School : ?

A) Medicine
B) Education
C) Food
D) Plants

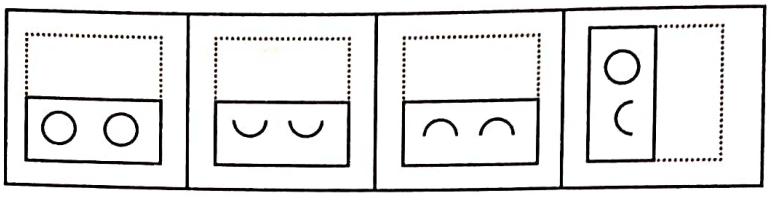
41. Figure out from amongst the four alternatives how the pattern would appear when the transparent sheet is folded at the dotted line.

Problem Figure



Transparent sheet

Answer Figure



(a) (b) (c) (d)

A) a
B) b
C) c
D) d

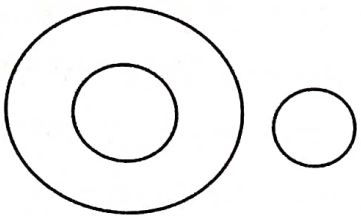
42. If wall is called window, window is called door, door is called floor, floor is called roof and roof is called ventilator, what will a person stand on ?

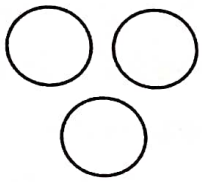
A) Door
B) Ventilator
C) Roof
D) Floor

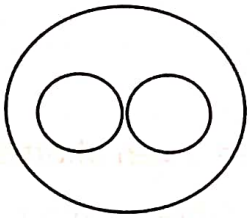
43. In a code language, if SUGAR is coded as ZNMDB and TEA is coded as FLD, how would you code GRATE in the same code for ?

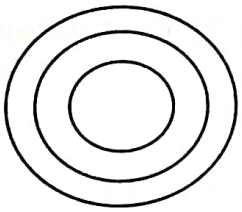
A) BNDFL
B) MBDFL
C) LDZMN
D) FLDZB

44. Which of the following diagrams indicates the best relation between Author, Lawyer and Singer ?

a. 

b. 

c. 

d. 

A) a B) b C) c D) d

45. Find the next term of the series: 8, 16, 48, 192, _____.

A) 960 B) 886

C) 990 D) 740

46. Ravi behaves strangely at times and, therefore, nobody gets _____ with him.

A) about B) through

C) along D) up

47. Light : Blind

A) speech : dumb

B) language : deaf

C) tongue : sound

D) voice : vibration

48. She set up the institutions of international _____.

A) repute

B) renown

C) famous

D) reputation

49. A sentence/a part of the sentence is underlined. Below are given alternatives to the underlined part which may improve the sentence. Choose the correct alternative. In case no improvement is needed choose 'No improvement.' The main part of <u>his speech</u> was well understood.

A) That he spoke

B) In the speech of his

C) Made when he spoke

D) No improvement

50. One must help his siblings. (spot the error)

A) Her

B) One's

C) Him

D) None of the above

Directions : Read the passage carefully and answer the questions **51-56** given below :

Working women, who are earning cash and having access to mobile phones, perpetrate more spousal violence on husbands in India, revealed research conducted by health experts at the International Institute for Population Sciences (IIPS), Mumbai. This could be for several reasons. "For instance, as women gain economic autonomy, men may feel that their masculinities are being challenged, and may indulge in controlling wife, or indulging in alcoholic behaviour, leading to experience of spousal violence by cash earning women," according to the research titled 'Prevalence and risk factors of physical violence against husbands: evidence from India' (2023), published by Cambridge University Press.

The research was conducted by Aparajita Chattopadhyay, Deepanjali Vishwakarma, Suresh Jungari (all IIPS), and Santosh Kumar Sharma (The George Institute for Global Health, New Delhi). They observed that 'access to mobile phones helps empower women, and this could be a threat to a husband, leading to restricting wife in communication, leading to spousal violence'. With the tremendous increase in mobile usage, they found that 'improved social network of a wife, who gets support to indulge in violent acts for varying reasons, reporting of husband's behavioural traits to peers or relatives though mobile phones by wife, exposure to violent media content, could be possible reasons for perpetration of violence of women on men'.

A stirring finding of the study was that with increase in wife's age, spousal violence on husband increased. Older women gained authority with age, leading to more violence on husbands with increasing age of wife. It revealed that in India, spousal violence against men stands at 29 per 1,000. The proportion of currently married women committing spousal violence against their husband varied from 2 per 1,000 in Sikkim to 90 per 1,000 in Tamil Nadu in NFHS-4. It was observed that the prevalence of spousal violence against husbands increased rapidly in the majority of the States, except Sikkim, Goa, and Mizoram, during 2005-06 to 2015-16.

The prevalence of violence against husband was higher in nuclear family (34/1,000) compared to non-nuclear family (28/1,000); higher among those who live in poorest household; who were exposed to TV (31.4/1,000), or working and getting paid in cash (43/1,000) than those who were not working.

The researchers noted that the prevalence of violence against husbands was higher among those women whose - husbands consumed alcohol (56.1/1,000), when women were afraid of their husbands (31.4/1,000), who had childhood exposure of parental violence (66.9/1,000), husbands displayed increasing marital control behaviour. Overall prevalence of violence was low in India as compared to other countries following low levels of reported violence against men, or societal pressure to prove masculinity, and remain silent about abuse for the fear of shame, and limited awareness.

51. Which of the following is not a reason for spousal violence on husbands in India ?

A) Economic freedom of women

B) Threat on masculinity of men

C) Women indulging in controlling her husband

D) Alcoholic behaviour of men

52. Spousal violence on husbands is more by

A) Working women

B) Women having access to mobile phones

C) Both the above

D) None of the above

53. Which of the following statement is correct ?

I. Violence on husband increases with increase in women's age.

II. Spousal violence is more among older women.

A) Only I is correct

B) Only II is correct

C) Both are correct

D) None of the above is correct

54. Which State has the lowest rate of spousal violence on men in India ?

A) Tamil Nadu

B) Andhra Pradesh

C) Rajasthan

D) Sikkim

55. Prevalence of violence against husbands increased rapidly in

A) Sikkim

B) Tamil Nadu

C) Goa

D) Mizoram

56. What according to the author is the reason for low prevalence of violence against husbands in India as compared to other countries ?

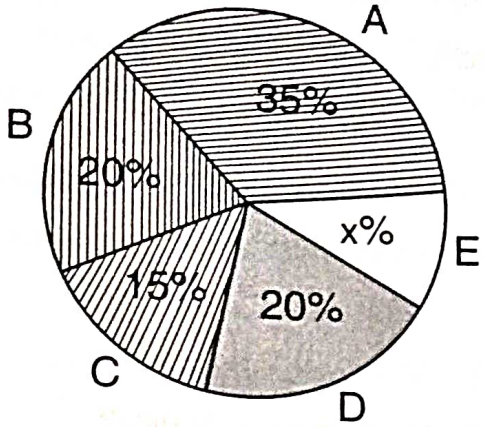
A) Violence against men is not reported

B) Societal pressure to prove masculinity

C) Remain silent due to fear of shame

D) All the above

Direction : Question numbers **57, 58** and **59** are based on the following pie diagram.



A : Printing cost
B : Cost of paper
C : Royalty
D : Advertisement charges
E : Other charges

57. If the cost of paper is Rs. 16,000, then find the amount of other charges in Rs. is

A) 16,000 B) 10,000 C) 8,000 D) 12,000

58. The tax deducted at source is 10% of the royalty amount. Then the amount of tax paid is

A) ₹ 1,200 B) ₹ 800 C) ₹ 1,000 D) ₹ 8,000

59. What is the central angle of the sector corresponding to the expenditure incurred on Royalty ?

A) 30° B) 36° C) 54° D) 60°

60. **Statement** : Detergents should be used to clean clothes.
Assumptions : I) Detergents form more lather.
II) Detergents help to dislodge grease and dirt.

A) Only assumption I is implicit
B) Only assumption II is implicit
C) Either I or II is implicit
D) Neither I nor II is implicit