



TEST FORM NUMBER

## INSTRUCTIONS TO CANDIDATE

Maximum Marks : 70  
Total Questions : 70  
Time Allowed : 45 Min.

**Read the following instructions carefully before you begin to attempt the questions**

- (1) This booklet contains 70 questions in all comprising the following three parts.
  - **Part-(I) : English** (20 Questions)
  - **Part-(II) : Physics** (25 Questions)
  - **Part-(III) : Math** (25 Questions)
- (2) All the questions are compulsory and carry equal marks.
- (3) Before you start to attempt the questions, you must explore this booklet and ensure that it contains all the pages and find that no page is missing or replaced. If you find any flaw in this booklet, you must get it replaced immediately.
- (4) **There is no negative marking.**
- (5) You will be supplied the Answer-sheet separately by the invigilator. You must complete the details of Name, Roll number, Test name/Id and name of the examination on the Answer-Sheet carefully before you actually start attempting the questions. You must also put your signature on the Answer-Sheet at the prescribed place. These instructions must be fully complied with, failing which, your Answer-Sheet will not be evaluated and you will be awarded 'ZERO' mark.
- (6) Answer must be shown by completely blackening the corresponding circles on the Answer-Sheet against the relevant question number by **pencil or Black/Blue ball pen** only.
- (7) A machine will read the coded information in the OMR Answer-Sheet. In case the information is incompletely/different from the information given in the application form, the candidature of such candidate will be treated as cancelled.
- (8) The Answer-Sheet must be handed over to the Invigilator before you leave the Examination Hall.
- (9) Failure to comply with any of the above Instructions will make a candidate liable to such action/penalty as may be deemed fit.
- (10) Answer the questions as quickly and as carefully as you can. Some questions may be difficult and others easy. Do not spend too much time on any question.
- (11) Mobile phones and wireless communication device are completely banned in the examination halls/rooms. Candidates are advised not to keep mobile phones/any other wireless communication devices with them even switching it off, in their own interest. Failing to comply with this provision will be considered as using unfair means in the examination and action will be taken against them including cancellation of their candidature.
- (12) No rough work is to be done on the Answer-Sheet.
- (13) No candidate can leave the examination hall before completion of the exam.

NAME OF CANDIDATE:.....  
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**DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE TOLD TO DO SO**

**ENGLISH**

**Direction (1-4):** Read the passage given below and answer the questions that follow:

Kashmir is known or said as the land of heaven. Nature over there gives more peace of mind and the positive energy in oneself, it makes you feel fresh. Kashmir is the land of beauty. An inspiration for so much art, music, and poetry, Kashmir is paradise; a nature lover's wonderland and a shopper's dream come true. Kashmir is the best place for tourism. Kashmir is in the northwest. Jammu is the most visited part of Jammu and Kashmir State. The Mughals called Kashmir 'Paradise on Earth' where they journeyed across the hot plains of India, to the cool valleys in summer. In winter, when snow carpets the mountains and everywhere is snow and snow, there is skiing, tobogganing, sledge-riding, etc. along the high slopes. In the spring and summer seasons, the beauty of Kashmir is at its peak. During summer seasons, the whole valley is a mosaic of varying shades of green trees, rice fields, meadows, trees, etc.

- When the beauty of Kashmir is at its peak?  
(A) In spring and winter seasons  
(B) In rainy and summer seasons  
(C) In spring and rainy seasons  
(D) In spring and summer seasons
- Which of the following words could replace the word 'paradise' as used in the passage?  
(A) Dormitory (B) Hell  
(C) Zion (D) Nadir
- Which place is the most visited place according to the passage?  
(A) Jammu (B) Kashmir  
(C) Northeast (D) Northwest
- Who called Kashmir 'Paradise on Earth'?  
(A) Mourya (B) Mughal  
(C) Maratha (D) British
- Change the voice:  
I shall have written the letter to my father.  
(A) The letter will be written by me to my father.  
(B) The letter will have been written by me to my father.  
(C) The letter would have been written by me to my father.  
(D) The letter will have written by me to my father.
- Identify the correctly spelt word:  
(A) sensasion (B) sansassion  
(C) sansation (D) sensation
- Select the word which means the same as the group of words given.  
The action of driving or pushing forward  
(A) Propulsion (B) Astern  
(C) Astute (D) Dominion
- Given below are four jumbled sentences. Pick the option that gives their correct order.  
India must  
P. approach with regard  
Q. to her security problems.  
R. adopt a bellicose  
(A) RQP (B) RPQ  
(C) PQR (D) QPR

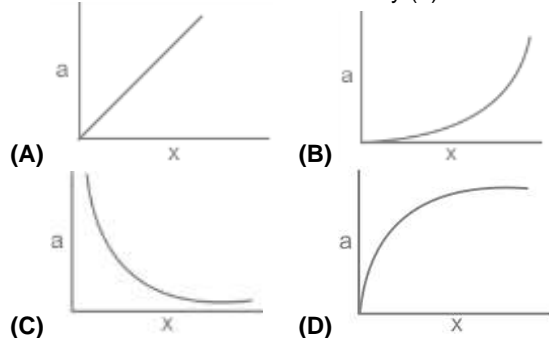
- Spot the erroneous parts, if any, in the following sentences:  
Ten kilometers (a) / are considered (b) / very easy to travel. (c) / No Error (d)  
(A) A (B) B  
(C) C (D) D
- Spot the erroneous parts, if any, in the following sentences:  
Cauvery is known as (a) / Dakshin Ganga and is known (b) / for its sceneries and sanctity. (c) / No error (d)  
(A) A (B) B  
(C) C (D) D
- Spot the erroneous parts, if any, in the following sentences:  
Nishi along with her (a) / sister Nipu are planning (b) / to go to Darjiling (c) / No error (d)  
(A) A (B) B  
(C) C (D) D
- A sentence, split into four parts, has been given. Choose the best order which produces the original sentence:  
behaviour in (1)/ this matter (2)/ I can't account (3)/ for his usual (4)  
(A) 1324 (B) 3412  
(C) 3214 (D) 4321
- Choose the most appropriate answer and fill in the blanks:  
The Noun form of 'protect' is, \_\_\_\_\_.  
(A) Protecting (B) Protective  
(C) Protection (D) Protector
- Choose the most appropriate answer and fill in the blanks:  
He is unlikely to come to the party but \_\_\_\_\_ I would talk to him.  
(A) if he is to come (B) if he comes  
(C) if he would come (D) if he will come
- Choose the most appropriate answer and fill in the blanks:  
\_\_\_\_\_, had made an attempt.  
(A) All but her (B) All but herself  
(C) All but hers (D) All but she
- Choose the most appropriate answer and fill in the blanks:  
The player \_\_\_\_\_ has scored a century in the match is my brother.  
(A) Which (B) Whom  
(C) Who (D) Whose
- Choose the word almost opposite in meaning to the word given below:  
FLOURISH  
(A) Garnish (B) Hinder  
(C) Amplify (D) Develop
- Choose the word almost nearest in meaning to the word given below:  
INTERPID  
(A) Gallant (B) Insecure  
(C) Cowardly (D) Invisible
- Choose the option the expresses the meaning of the given Idiom.  
At large  
(A) A very big opportunity  
(B) A criminal escaped or not yet captured

- (C) To have a big heart  
(D) A big appetite

20. Choose the active sentence.  
Let the boats be lowered.  
(A) Lower the boats  
(B) The boats have to be lowered  
(C) The boats should be lowered  
(D) Please lower the boat

## PHYSICS

21. If the potential energy of a body in a conservative force field is directly proportional to the cube of the displacement ( $x$ ) from zero potential, then which of the following graph correctly related the relation between the acceleration of the body ( $a$ ) and  $x$ ?



22. Two bodies A and B move in the space due to the gravitational attraction. If the masses of the bodies A and B are in the ratio 2: 3 and their acceleration at the particular time are  $3 \text{ m/s}^2$  and  $2 \text{ m/s}^2$  respectively, what is the acceleration of their center of mass at that time? (in  $\text{m/s}^2$ )

- (A) 0 (B) 0.1  
(C) 1 (D) 2.8

23. A torque of 64 Nm is applied on a circular disc of mass 16 kg and radius of 1 m. If the disc is rotating in an axis passing through center and perpendicular to the plane of the disc, then what is the angular acceleration of the disc? (in  $\text{rad/s}^2$ )

- (A) 2 (B) 4  
(C) 8 (D) 12

24. What is the value of  $(a+1)$  if  $f(x)$  is a continuous function  $f(x) = \begin{cases} a+b, & x > 0 \\ -ab+2, & x \leq 0 \end{cases}$

- (A)  $b+1$  (B)  $3b$   
(C)  $3/(b+1)$  (D)  $4/(b+1)$

25. If  $y = x \ln x - x$ , then  $\frac{d^2y}{dx^2} = x^N$  what is the value of N?

- (A) 0 (B) 1  
(C) -1 (D) 2

26.  $\int \sec^4 \theta d\theta = ?$

- (A)  $\tan 3\theta + \tan \theta + C$  (B)  $\tan 3\theta + \tan 2\theta + C$   
(C)  $\tan 2\theta/3 + \tan \theta/2 + C$  (D)  $\tan 3\theta/3 + \tan \theta + C$

27. In the figure given below, a body of mass 10 kg and velocity 10 m/s hits a wall at an angle of  $60^\circ$  with respect to the vertical. Assuming no force in the vertical direction, what is the impulse made by the wall on the body? (in  $\text{kg m/s}$ )

- (A) 50 (B) 100  
(C) 150 (D) 200

28. A body under constant force of 5 N moves at a direction of  $60^\circ$  away from the direction of force. The work done is 100 J. If the same body moves in the

same direction as that of the force, how much needs to be done for same displacement?

- (A) 50 J (B) 100 J  
(C)  $100\sqrt{3}$  J (D) 200 J

29. A body is given a constant angular acceleration of  $5 \text{ rad/s}^2$ . If the body has been in rest initially, at time  $t = 5$  seconds, what is the ratio of the speeds of the particles in the body present at 5 cm and 10 cm away from the axis of rotation respectively?

- (A) 25: 1 (B) 5: 1  
(C) 1: 2 (D) 2: 1

30. Which of the following is a state function?

- (A) Heat supplied (B) Work done  
(C) Internal energy (D) None of the above

31. What is the amplitude of the resultant wave obtained on super imposing  $y = A \sin \omega t$  and  $y = A \sin (\omega t + \pi/3)$ ?

- (A) A (B)  $\sqrt{2}A$   
(C)  $\sqrt{3}A$  (D)  $2A$

32. For a spring-mass system executing S.H.M. in horizontal direction, the position is given by  $x(t) = A \cos \omega t$ . ( $\omega = \sqrt{k/m}$ ). At which of the following time, is the kinetic energy and the potential energy of the system same in magnitude? ( $T$  = Time period)

- (A) T (B)  $T/2$   
(C)  $T/4$  (D)  $T/8$

33. Which of the following is an extensive property?

- (A) Heat capacity (B) Pressure  
(C) Temperature (D) Molar volume

34. A real heat engine is used to do some work which is 50% as efficient as a carnot engine working with same source and sink temperature. If the source and sink temperatures are  $727^\circ \text{C}$  and  $27^\circ \text{C}$  and the amount of heat supplied from the source is 200 J, what is the amount of work done by the engine?

- (A) 140 J (B) 180 J  
(C) 70 J (D) 90 J

35. Two new gases A and B are found. Both of them are maintained at same temperature and it is found that the ratio of root mean square velocities of A and B is 3 : 1. What is the ratio of the molecular masses of A and B?

- (A) 3 : 1 (B) 1 : 3  
(C) 9 : 1 (D) 1 : 9

36. The closed surface integral ( $\oint E \cdot dS$ ) around a particular charge system, depends on \_\_\_\_\_

- (A) Shape of the closed surface  
(B) Radius/Dimensions of the surface  
(C) Type of medium surrounding the charge  
(D) All the above

37. A spherical shell of radius 2 cm and uniform charge density of  $3 \text{ mC/m}^2$  is provided. What is the work done in moving a charge of  $1 \mu\text{C}$  a distance of 1 mm inside the shell?

- (A)  $10^{-6} \text{ J}$  (B)  $10^{-4} \text{ J}$   
(C) 0 J (D) Cannot be inferred

38. Which of the following is the correct reason behind the decrease in resistance with increase in temperature in semi-conductors?

- (A) Number of charge carriers increases which overpowers relaxation time decrease  
(B) Number of charge carriers decreases which is overpowered by relaxation time increase

- (C) Both number of charge carriers and relaxation time increases  
(D) Both number of charge carriers and relaxation time decreases
39. What is the dimensional formula of magnetic moment?  
(A)  $[ML^2TA^2]$  (B)  $[M^0L^2T^0A]$   
(C)  $[M^0L^2T^1A]$  (D)  $[M^0L^2T^2A]$
40. In a LCR series circuit with AC source of angular frequency  $\omega$ , ( $L$  = Inductance,  $C$  = Capacitance and  $R$  = Resistance), then what is the ratio of  $X_L$  to  $X_C$  during resonance?  
(A)  $L/C$  (B)  $C/L$   
(C)  $\omega C/L$  (D) 1
41. In a concave mirror, an object placed till 15 cm away from the mirror forms a virtual image and real image when kept at or more than 15 cm away from the mirror. At what distance from the mirror should the object be placed such that the magnification becomes 1?  
(A) 15 cm (B) 7.5 cm  
(C) 30 cm (D) 60 cm
42. For a slit of size  $a$  meters illuminated by a light waves of wavelength  $\lambda$  meters, then what is the value of the fresnal distance ( $z$ ) given by?  
(A)  $a/\lambda$  (B)  $\lambda/a$   
(C)  $a^2/\lambda$  (D)  $\lambda^2/a$
43. If Torque ( $T$ ), mass ( $M$ ) and the angular momentum ( $P$ ) are the basic units of measurement, then which of these is the unit of measurement of distance?  
(A)  $P/\sqrt{TM}$  (B)  $\sqrt{PT/M}$   
(C)  $P\sqrt{T/M}$  (D)  $\sqrt{TM}/P$
44. Which of the following option is an incorrect combination of technology and the governing scientific principles?  
(A) Sonar – Reflection of ultrasonic waves  
(B) Steam engine – Laws of thermodynamics  
(C) Rocket propulsion – Newton's law of motion  
(D) Electric generator – Biot Savart's law
45. The rate of deceleration of a body initially moving with a speed of 5 m/s is directly proportional to the square of the velocity. If the speed at the end of 24 seconds is 1 m/s, then what is the speed at the end of 54 seconds? (in m/s)  
(A) 0.2 (B) 0.4  
(C) 0.5 (D) 0.8
- MATH**
46. Every element of a  $4 \times 4$  matrix is doubled. If initially the discriminant value of the matrix was  $D$ , then what is the discriminant value after doubling?  
(A)  $4D$  (B)  $2D$   
(C)  $8D$  (D)  $16D$
47. A bag contains three coins. Two of them are tampered such that the probability of head when the coins are tossed are  $2/3$  and  $5/6$  respectively. Third coin is a normal coin.  $X$  choses a coin randomly and tosses it. What is the probability that the outcome is a head?  
(A)  $2/3$  (B)  $5/6$   
(C)  $6/7$  (D)  $11/18$
48. What is the wavenumber of the waves emitted by the transmission of electron in hydrogen atom from  $n = 3$  to  $n = 2$ ? Use Rydberg constant,  $R = 1.097 \times 10^7 \text{ m}^{-1}$   
(A)  $1.522 \times 10^6 \text{ m}^{-1}$  (B)  $1.255 \times 10^6 \text{ m}^{-1}$   
(C)  $1.525 \times 10^6 \text{ m}^{-1}$  (D)  $1.525 \times 10^5 \text{ m}^{-1}$
49. If  $a$  is an element of set  $A$  implies that it is also an element of  $B$ , then  $B$  is \_\_\_\_\_ of  $A$ .  
(A) Superset (B) Subset  
(C) Power set (D) Null set
50. Which of the following quadratic equations have a complex root?  
(A)  $7x^2 + 11x + 4$  (B)  $11x^2 + 15x + 5$   
(C)  $17x^2 + 23x + 8$  (D)  $2x^2 + 17x + 34$
51. If the coordinates of the focus and the vertex of a parabola are  $(8, 1)$  and  $(3, 0)$  respectively, then what is the equation of the directrix of the parabola?  
(A)  $y + 5x = -9$  (B)  $5x + y = -11$   
(C)  $5y + x = -9$  (D)  $x + 5y = -11$
52. What is the remainder when  $10^{n+1} - 9n$  is divided by 81, where  $n$  is a natural number?  
(A) 1 (B) 9  
(C) 10 (D) 12
53. What is the value of mode – median of the following data set?  
7, 5, 15, 23, 55, 67, 23, 21, 85, 65, 55, 21, 67, 55, 11, 3, 7  
(A) 25 (B) 34  
(C) 38 (D) 42
54.  $A$  is a row matrix and  $B$  is a column matrix such that,  $AB = C$ . How many elements does  $C$  have?  
(A) 1  
(B)  $n^2$ , where  $n$  = Number of columns in  $A$   
(C)  $m^2$ , where  $m$  = Number of rows in  $B$   
(D)  $n \times m$ , where  $n$  = Number of columns in  $A$  and  $m$  = Number of rows in  $B$
55. If  $A$  is  $3 \times 3$  matrix such that the elements of the matrix is given by  $a_{ij} = |i - j|$ , then what is the value of  $|A|$ ?  
(A) 0 (B) 2  
(C) 4 (D) 6
56. What is the  $|\text{adj}(A)|$  if  $|A| = 3$ ?  
(A) 3 (B)  $1/3$   
(C) 1 (D) None of the above
57. What is the equation of the plane which passes through the following points?  
 $A(1, 2, 0)$ ,  $B(2, 3, 0)$  and  $C(4, 4, 0)$   
(A)  $x - y + z + 1 = 0$  (B)  $z = 0$   
(C)  $x + y - z + 1 = 0$  (D)  $x - y + z = 0$
58. A company uses the following code for employee number generation. It consists of four digits. First two are alphabets and should not be same alphabets. Last two digits are numerical and again same number cannot be repeated. How much employee numbers can be created?  
(A) 58500 (B) 55800  
(C) 65800 (D) 65000
59. What is the domain of the following function?  
$$\frac{\sqrt{x-2}}{x^2 - 16x + 63}$$
  
(A)  $R$  (B)  $[2, \infty) - \{7\}$   
(C)  $[2, \infty) - \{7, 9\}$  (D)  $R - \{7, 9\}$



60.  $\left(\sin \frac{\pi}{4} \sin \frac{2\pi}{4} + \cos \frac{\pi}{4} \cos \frac{2\pi}{4}\right) + \left(\sin \frac{2\pi}{4} \sin \frac{3\pi}{4} + \cos \frac{2\pi}{4} \cos \frac{3\pi}{4}\right) + \dots + \left(\sin \frac{8\pi}{4} \sin \frac{9\pi}{4} + \cos \frac{8\pi}{4} \cos \frac{9\pi}{4}\right) = \sqrt{n}$   
then what is the value of n?  
(A) 8 (B) 16  
(C) 32 (D) 64
61. Which one of the following is a possible relation between angles A and B if vector P is a unit vector?  $P = \sin A \mathbf{i} + \sin B \mathbf{j}$   
(A)  $A + B = \pi/2$  (B)  $A - B = \pi/2$   
(C)  $A = 2B$  (D) Both (A) and (B)
62. What are the possible values of x, if Probability of an event E is given by  $P(E) = \sqrt{x^2 + 1/4}$ ?  
(A)  $(-\sqrt{3}/2, \sqrt{3}/2)$  (B)  $[-\sqrt{3}/2, \sqrt{3}/2]$   
(C)  $R - (-\sqrt{3}/2, \sqrt{3}/2)$  (D)  $R - [-\sqrt{3}/2, \sqrt{3}/2]$
63.  $\sin 2x + 2 \sin 4x + \sin 6x = k(\sin x \cdot \cos^2 x \cdot \cos 2x)$ , what is the value of k?  
(A) 4 (B) 8  
(C) 16 (D) 32
64.  $dy/dx - y = ex$  then find the value of y-  
(A)  $xe^x + C$  (B)  $xe^{-x} + C$   
(C)  $xe^x + Ce^x$  (D)  $xe^{-x} + Ce^{-x}$
65. Which of the following is true according to Demorgan law?  
(A)  $E' \cap F = (E \cup F)'$  (B)  $E' \cup F = (E \cup F)'$   
(C)  $E' \cap F' = (E \cup F)'$  (D)  $E' \cup F' = (E \cup F)'$
66. The radius of  $n^{\text{th}}$  orbit in a hydrogen atom is proportional to  $n^k$  according to the Bohr's model. What is the value of k?  
(A) 1 (B) 2  
(C)  $1/2$  (D)  $-1/2$
67. In an intrinsic semiconductor, number density of holes is  $5 \times 10^{34}/\text{m}^3$ , then which of the following is true about the number density of electrons?  
(A)  $< 5 \times 10^{34}/\text{m}^3$  (B)  $> 5 \times 10^{34}/\text{m}^3$   
(C)  $= 5 \times 10^{34}/\text{m}^3$  (D) No correlation exists
68. Find the area of the bounded by  $f(x) = \sin x$  and  $g(x) = 1 - \sin x$  from  $x = \pi/6$  to  $x = \pi/2$ . (In sq. units)  
(A)  $\sqrt{3} - \pi/6$  (B)  $\sqrt{3} - \pi/2$   
(C)  $\sqrt{3} - \pi/3$  (D)  $\sqrt{3} - \pi/\sqrt{3}$
69.  $\int e^x (\tan^2 x + 2 \tan^3 x + 2 \tan x) dx = ?$   
(A)  $e^x \sec^2 x + c$  (B)  $e^x \tan^2 x + c$   
(C)  $e^x \tan x + c$  (D)  $e^x \sec x + c$
70. Which of the following is the solution of the differential equation?  
 $\frac{dy}{dx} = 2 \cos^2 x \cos^2 y + 4 \cos^2 x$   
(A)  $\tan y = \sin 2x + 5x/2 + c$  (B)  $\sec y = \sin 2x + 5x/2 + c$   
(C)  $\tan y = \sin 2x/2 + 5x + c$  (D)  $\sec y = \sin 2x/2 + 5x + c$

**Space for rough work**

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**ENGLISH**

- Ans.1(D)** In spring and summer seasons.  
It is clearly mentioned in the passage that "In spring and summer seasons, the beauty of Kashmir is at its peak".  
**Hence, the chosen option is correct.**
- Ans.2(C)** Zion.  
Zion- the heavenly city or kingdom of heaven.  
Paradise- (in some religions) heaven as the ultimate abode of the just.  
Dormitory- a large bedroom for a number of people in a school or institution.  
Hell- a place regarded in various religions as a spiritual realm of evil and suffering.  
Nadir- the lowest or most unsuccessful point in a situation.  
**As the given word in the question has the same meaning as the word chosen from the option it will be our right answer.**
- Ans.3(A)** Jammu.  
It is clearly mentioned in the passage that Kashmir is in the northwest Jammu is the most visited part of Jammu and Kashmir State.  
So, the chosen option is correct.  
**Hence, the chosen option is correct.**
- Ans.4(B)** Mughal.  
It is clearly mentioned in the 2nd paragraph of the passage that Mughals called Kashmir 'Paradise on Earth'.
- Ans.5(B)** If the active sentence is - subject + shall/will + have + v3 + object + other words.  
Then passive voice will be- object + shall/will+ have + been + v3 + by + subject + other words.  
**As the chosen option follows this structure so this will be our correct answer.**
- Ans.6(D)** Sensation- a physical feeling or perception resulting from something that happens to or comes into contact with the body.
- Ans.7(A)** Propulsion- the action of driving or pushing forwards.  
Dominion- sovereignty or control.  
Astern- behind or toward the rear of a ship or aircraft.  
Astute- very clever; good at judging people or situations.  
**As the chosen option expresses the best meaning of the given group of the word it will be correct.**
- Ans.8(B)** The easiest way of solving this section is to find a pair.  
• The first pair will be "must adopt" means sentence will start with R.  
• The second pair will be "bellicose approach" means RP.  
• Now the construction will be RPQ.  
The correct arrangement will be-  
**India must adopt a bellicose approach with regard to her security problems.**
- Ans.9(B)** Whenever distance is considered as a single unit we take it as a singular noun.  
• So, the verb used for it will also be singular.  
The correct sentence will be-  
**Ten kilometers is considered very easy to travel.**
- Ans.10(C)** Some Nouns like "scenery, poetry, luggage, baggage" are always used in the singular form.  
So, we need to replace Sceneries with Scenery for making the sentence grammatically correct.  
The correct sentence will be-  
**Cauvery is known as Dakshin Ganga and is known for its scenery and sanctity.**

- Ans.11(B)** If two nouns are joined with **as well as, along with, accompanied by, together with**, the first Noun is considered as the subject of the sentence and verb is used according to it.  
• So, we need to replace **Are** with **Is** because the subject of the verb is Nishi that is singular.  
The correct sentence will be-  
**Nishi along with her sister Nipu is planning to go to Darjeeling.**
- Ans.12(B)** The easiest way of solving this section is to find a pair.  
• The first pair will be "account for" means 34.  
• The second pair will be "usual behaviour" means 41.  
• Now the final construction will be- 3412.  
The correct arrangement will be-  
**I can't account for his usual behaviour in this matter.**
- Ans.13(C)** The correct answer is option 3 i.e. **Protection**.  
The Noun form of Protect will be **Protection**.  
VERB + ION - NOUN is formed.  
Protect + ion- Protection.  
**Hence, the chosen option will be correct.**
- Ans.14(B)** As all verbs used in the statement are in the present we need to keep the coming verb in the same tense.  
• As the chosen option is in the present tense it will be correct.  
The correct sentence will be-  
**He is unlikely to come to the party but if he comes I would talk to him.**
- Ans.15(D)** As we need **subject** here we need to choose a **subjective case**.  
• As the chosen option is the **subjective case** it will be correct.  
The correct sentence will be-  
**All but she had made an attempt.**
- Ans.16(C)** In the case of relative pronoun, we need to look at the antecedent coming before it  
• "Who" is used for a person.  
• "which" is used for non-living things.  
• As the player is a person we have to use "who" for it.  
The correct sentence will be-  
**The player who has scored a century in the match is my brother.**
- Ans.17(B)** Flourish- (of a living organism) grow or develop in a healthy or vigorous way, especially as the result of a particularly congenial environment.  
Garnish- decorate or embellish (something, especially food).  
Hinder- make it difficult for (someone) to do something or for (something) to happen.  
Amplify- increase the volume of (sound), especially using an amplifier.  
Develop- grow or cause to grow and become more mature, advanced, or elaborate.  
**As the chosen word expresses the opposite meaning of the given word it will be our correct answer.**
- Ans.18(A)** Intrepid- fearless; adventurous (often used for rhetorical or humorous effect).  
Gallant- (of a person or their behaviour) brave; heroic.  
Insecure- not firm or fixed; liable to give way or break.  
Cowardly- lacking courage.  
Invisible- unable to be seen.  
**As the chosen option best expresses the meaning of the given word so, this will be our right answer.**
- Ans.19(B)** The meaning of the given idiom is-

**At large-** a criminal escaped or not yet captured.  
**As the meaning of the given idiom is the same as the chosen option it will be the correct answer.**

- Ans.20(A)** If the passive voice is- let + subject + be + v3.  
 Then the active voice will be- v1 + subject.  
**As the given structure is followed by the chosen option it will be the right choice.**

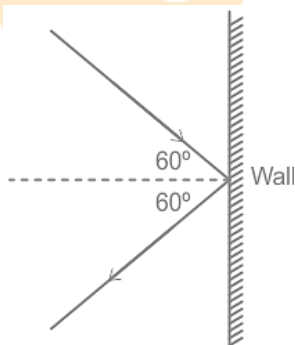
## PHYSICS

- Ans.21(B)** Potential  $V(x) \propto x^3$   
 $V = kx^3$   
 Force =  $-dV/dx$   
 $\Rightarrow -3kx^2$   
 Acceleration =  $F/m$   
 $\Rightarrow -3k/m \times x^2$   
 It is a parabola  
 when  $a \propto x^2$
- Ans.22(A)** Since the gravitational attraction is an internal force, it cannot accelerate the center of mass  
 $\therefore$  Acceleration of the center of mass =  $0 \text{ m/s}^2$
- Ans.23(C)** Torque = Moment of inertia  $\times$  Angular acceleration  
 $64 = 1/2 \times Mr^2 \times \text{Angular acceleration}$  [ $\therefore$  Moment of inertia of circular disc =  $1/2 \times Mr^2$ ]  
 $64 = 1/2 \times 16 \times 1^2 \times \text{Angular motion}$   
 $64 = 8 \times \text{Angular motion}$   
 Angular motion =  $8 \text{ rad/s}^2$
- Ans.24(C)**  $\lim_{x \rightarrow 0} f(x) = \lim_{x \rightarrow 0^+} f(x) = f(0)$   
 $a + b = -ab + 2$   
 $a + b + ab = 2$   
 $a + b + ab + 1 = 3$   
 $a(b+1) + 1(b+1) = 3$   
 $a+1 = 3/(b+1)$

- Ans.25(C)**  $\frac{dy}{dx} = x \cdot \frac{1}{x} + \ln x - 1 = \ln x$   
 $\frac{d^2y}{dx^2} = \frac{1}{x} = x^{-1}$   
 $N = -1$

- Ans.26(D)**  $\sec^4 \theta = \sec^2 \theta \times \sec^2 \theta = (\tan^2 \theta + 1) \sec^2 \theta$   
 $\therefore \int (\tan^2 \theta + 1) \sec^2 \theta d\theta$   
 Let  $\tan \theta = t \Rightarrow \sec^2 \theta d\theta = dt$   
 $\therefore I = \int (t^2 + 1) dt = \frac{t^3}{3} + t + C$   
 $= \tan^3 \theta / 3 + \tan \theta + C$

- Ans.27(B)**



Let us assume the direction away from the wall as positive direction

- Inward velocity  
 Horizontal component of velocity =  $-v \cos \theta$   
 $\Rightarrow -10 \times \cos 60^\circ = -5 \text{ m/s}$   
 Outward velocity  
 Horizontal component of velocity =  $v \cos \theta$   
 $\Rightarrow 10 \times \cos 60^\circ = 5 \text{ m/s}$   
 Impulse = Change in momentum  
 $\Rightarrow m(V_{\text{out}} - V_{\text{in}})$   
 $\Rightarrow 10 \times (5 + 5) = 100 \text{ kg m/s}$
- Ans.28(D)**  $W = Fs \cos \theta$   
 For same displacement,  $W \propto \cos \theta$

$W_1/W_2 = \cos 60^\circ / \cos 0^\circ$  [ $\therefore$  Same direction,  $\theta = 0^\circ$ ]

$$100/W_2 = 1/2$$

$$W_2 = 200 \text{ J}$$

- Ans.29(C)** Speed,  $v = \omega r$   
 For particles on same body,  $\omega$  is same  
 $\therefore v \propto r$

$$v_1/v_2 = r_1/r_2$$

$$\Rightarrow (5/10) = 1/2$$

Required ratio = 1 : 2

- Ans.30(C)** State function are those variables which only depends on the initial and final point of the thermodynamic system, not the path taken.  
 Work done and heat supplied depend on the path taken.  
 But internal energy depends only on the initial and final temperature.  
 $\therefore$  It is a state function

- Ans.31(C)**  $y_{\text{resultant}} = y_1 + y_2$   
 $\Rightarrow A \sin \omega t + A \sin (\omega t + \pi/3)$   
 $\Rightarrow 2A \sin (\omega t + \pi/6) \cos (\pi/6)$  [ $\therefore \sin A + \sin B = 2 \sin \{(A+B)/2\} \cos \{(A-B)/2\}$ ]  
 Amplitude =  $2A \cos (\pi/6)$   
 $\Rightarrow 2 \times A \times \sqrt{3}/2 = \sqrt{3}A$

- Ans.32(D)**  $x = A \cos \omega t$   
 $v = dx/dt = -A \omega \sin \omega t$   
 Kinetic energy = Potential energy  
 $1/2 mv^2 = 1/2 kx^2$   
 $1/2 m \times A^2 \times \omega^2 \times \sin^2 \omega t = 1/2 \times k \times A^2 \times \cos^2 \omega t$   
 $\sin^2 \omega t = \cos^2 \omega t$  [ $\therefore \omega^2 = k/m$ ]  
 It occurs when  
 $\omega t = (2n+1)\pi/4$   
 $\omega = 2\pi/T$   
 $2\pi/T = (2n+1)\pi/4$   
 $t = (2n+1)T/8$   
 when  $n = 0$ ,  $t = T/8$

- Ans.33(A)** **Heat capacity:**

It is the heat required to increase the temperature of the given mixture by  $1^\circ \text{C}$ . It depends on the amount of substance. More the substance, more is the heat required.

**$\therefore$  It is an extensive property**

**Pressure:**

Pressure depends only on temperature and type of material

**Temperature:**

Temperature only depends on pressure and composition

**Molar volume:**

Volume of 1 mole of substance. It does not depend on the amount of substance

- Ans.34(C)** Efficiency of a carnot's engine =  $(T_1 - T_2)/T_1$

Temperature are in K

$$T_1 = 727 + 273 = 1000 \text{ K}$$

$$T_2 = 27 + 273 = 300 \text{ K}$$

$$\text{Efficiency} = (1000 - 300) / 1000$$

$$\Rightarrow 0.7$$

$$\text{Efficiency of real engine} = 50\% \text{ of } 0.7 = 0.35$$

$$\text{Efficiency} = \text{Work done} / \text{Energy supplied}$$

$$0.35 = \text{Work done} / 200$$

$$\text{Work done} = 70 \text{ J}$$

- Ans.35(D)** For same temperature, the average kinetic energies of the gases are same.

$$1/2 m_a v_a^2 = 1/2 m_b v_b^2$$

$$m_a/m_b = (v_b/v_a)^2$$

$$\Rightarrow (1/3)^2 = 1 : 9$$

- Ans.36(C)** According to Gauss law,

$$\oint \vec{E} \cdot d\vec{S} = q/\epsilon$$

For constant  $q$ , It depends only on  $\epsilon$  i.e. The medium surrounding the charge.

- Ans.37(C)** Inside the spherical shell, the electric potential is constant



No work is done to move a charge in constant potential field.

$\therefore$  Work done = 0 J

**Ans.38(A)** Upon increasing the temperature, relaxation time decreases which tends to increase the resistance of the material.

But in semiconductors, upon increasing the temperature, the number of charge carriers increases which overpowers the effect of relaxation time and decrease the overall resistance

**Ans.39(B)** Magnetic moment =  $I \times \text{Area}$

$\Rightarrow [A] \times [L^2] \Rightarrow [M^0 L^2 T^0 A]$

**Ans.40(D)** During resonance,  $X_L = X_C$

$\therefore X_L/X_C = 1$

**Ans.41(C)** In concave mirror, virtual image is formed when object distance is less than focal length

And real image is formed when object distance is more than the focal length

$\therefore$  Comparing,  $f = -15 \text{ cm}$  [ $\therefore$  Concave mirror]

Magnification is 1, when the object is placed at  $C = 2f$

$\therefore$  Object distance =  $2 \times 15 = 30 \text{ cm}$

**Ans.42(C)** An aperture (i.e., slit or hole) of size  $a$  illuminated by a parallel beam sends diffracted light into an angle of approximately  $\lambda/a$ . This is the angular size of the bright central maximum. In travelling a distance  $z$ , the diffracted beam therefore acquires a width  $z \lambda/a$  due to diffraction. It is interesting to ask at what value of  $z$  the spreading due to diffraction becomes comparable to the size  $a$  of the aperture. We thus approximately equate  $z \lambda/a$  with  $a$ . This gives the distance beyond which divergence of the beam of width  $a$  becomes significant.

$z\lambda/a = a$

$\therefore$  Fresnel distance,  $z = a^2/\lambda$

**Ans.43(A)**  $T = [M^1 L^2 T^{-2}]$

$M = [M^1 L^0 T^0]$

$P = [M^1 L^2 T^{-1}]$

Let Unit of measurement  $[L] = T^a M^b P^c$

$[L] = [M^{a+b+c} L^{2a+2c} T^{-2a-c}]$

Comparing the power of  $M$ ,  $L$  and  $T$

$a + b + c = 0$  ---- 1

$2a + 2c = 1$

$\therefore a + c = \frac{1}{2}$

Substituting in equation 1

$b + \frac{1}{2} = 1$

$b = -1/2$

$-2a - c = 0$

$c = -2a$

$a + c = \frac{1}{2}$

$-a = \frac{1}{2}$

$a = -1/2$

$c = 1$

$\therefore [L] = T^{-1/2} M^{-1/2} P^1 = P/\sqrt{(TM)}$

**Ans.44(D)** Sonar – Sonar is a device that uses ultrasonic waves and captures the reflected waves from the obstacle to locate it.

Steam engine – Steam engine is an equipment to convert heat energy to mechanical work which follows the second law of thermodynamics

Rocket propulsion – Rocket propulsion works based on the newton's third law of motion where the opposite reaction from the propelling fuel provides the thrust for rocket propulsion

Electric generator – It works based on the principle of electromagnetic induction. Not on biot savart's law

**Ans.45(C)** Deceleration =  $-dv/dt$

Given  $-dv/dt \propto v^2$

$dv/dt = -kv^2$

$dv/(v^2) = -kdt$

Integrating from time  $t = 0$  to  $t = t$

$-1/v + 1/5 = -kt$

$1/v - 1/5 = kt$

At  $t = 24$  seconds,  $v = 1 \text{ m/s}$

$1/1 - 1/5 = 24k$

$4/5 = 24k$

$\therefore k = 1/30$

Now the equation of motion

$1/v - 1/5 = t/30$

For  $t = 54$

$1/v - 1/5 = 54/30$

$1/v - 1/5 = 9/5$

$1/v = 10/5 = 2$

$v = 0.5 \text{ m/s}$

## MATH

**Ans.46(D)** Change in discriminant value of  $(n \times n)$  matrix when every element is multiplied by  $k = k^n \times$  discriminant of the original matrix

In this case

Discriminant value after doubling =  $2^4 \times D = 16D$

**Ans.47(A)** Total probability = Probability of selecting first coin  $\times$  Probability of head in first coin + Probability of selecting second coin  $\times$  Probability of head in second coin + Probability of selecting third coin  $\times$  Probability of head in third coin

$\Rightarrow 1/3 \times 2/3 + 1/3 \times 5/6 + 1/3 \times 1/2$

$\Rightarrow 2/9 + 5/18 + 1/6 = (4 + 5 + 3)/18$

$\Rightarrow 12/18 = 2/3$

**Ans.48(A)** Wavenumber =  $R \times (1/n_2^2 - 1/n_1^2)$

$\Rightarrow 1.097 \times 10^7 \times (1/4 - 1/9)$

$\Rightarrow 1.097 \times 10^7 \times 5/36 = 1.522 \times 10^6 \text{ m}^{-1}$

**Ans.49(A)** If  $a$  is an element of set  $A$  implies that it is also an element of  $B$  then  $A \subset B$

**Ans.50(C)** For a quadratic equation  $ax^2 + bx + c = 0$ , to have complex roots

$b^2 < 4ac$

Equation I:

$7x^2 + 11x + 4$

$b^2 = 121$

$4ac = 112$

$b^2 > 4ac$ ,  $\therefore$  It does not have a complex root

Equation II:

$11x^2 + 15x + 5$

$b^2 = 225$

$4ac = 220$

$b^2 > 4ac$ ,  $\therefore$  It does not have a complex root

Equation III:

$17x^2 + 23x + 8$

$b^2 = 529$

$4ac = 544$

$b^2 < 4ac$ ,  $\therefore$  It has complex roots

Equation IV:

$2x^2 + 17x + 34$

$b^2 = 289$

$4ac = 272$

$b^2 > 4ac$ ,  $\therefore$  It does not have a complex root

**Ans.51(B)** Vertex and focus lies on the axis of the parabola

Slope of the axis =  $(y_2 - y_1) / (x_2 - x_1)$

$\Rightarrow (0 - 1) / (3 - 8) = 1/5$

Slope of directrix =  $-1/(\text{Slope of axis})$

[ $\therefore$  Axis  $\perp$  Directrix]

Slope of directrix =  $-5$

$\therefore$  Equation of directrix:  $y = -5x + c$

Let the axis meet directrix at the point  $P$

Vertex is the midpoint of  $P$  and focus

Let  $P = (x, y)$

Vertex,  $(3, 0) = \{(x + 8)/2, (y + 1)/2\}$  [ $\therefore$  Midpoint formula]

$x = -2, y = -1$

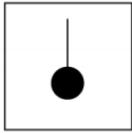
Substituting in equation directrix

Ans.52(C)  $-1 = 10 + c$   
 $c = -11$   
 Equation of directrix:  $y = -5x - 11$   
 $5x + y = -11$   
 $10 = 9 + 1$   
 $10^{n+1} = (9 + 1)^{n+1}$   
 Using binomial theorem  
 $10^{n+1} = {}^{n+1}C_0 + {}^{n+1}C_1 9^1 + {}^{n+1}C_2 9^2 + \dots$   
 $+ {}^{n+1}C_{n+1} 9^{n+1}$   
 $10^{n+1} = 1 + (n+1)9 + \text{Multiples of } 81 [\because 81 = 9^2]$   
 $10^{n+1} = 10 + 9n + 81m$   
 $10^{n+1} - 9n = 81m + 10$   
 $\therefore$  Remainder when  $10^{n+1} - 9n$  is divided by 81  
 $= 10$

Ans.53(B) Arranging the data in ascending order  
 3, 5, 7, 7, 11, 15, 21, 21, 23, 23, 55, 55, 55, 55, 65, 67, 67, 85  
 There are totally 17 terms  
 $\therefore$  8th term is the median = 21  
 Mode = Number with maximum occurrence = 55  
 Difference =  $55 - 21 = 34$

Ans.54(A) Let  $n$  = number of columns of  $A$  and  $m$   
 $=$  Number of rows of  $B$   
 Dimensions of  $A = 1 \times n$   
 Dimensions of  $B = m \times 1$   
 For multiplication,  $n = m$   
 The product  $C$  has a dimension of  $1 \times 1$   
 Number of elements of  $C = 1$

Ans.55(C) If  $a_{ij} = |i - j|$



Ans.56(C)  $|A| = 0 (0 - 1) - 1(0 - 2) + 2(1 - 0) \Rightarrow 4$   
 Determinant of adjoint of any invertible matrix  
 $= 1$

Ans.57(B)  $A(1, 2, 0)$ ,  $B(2, 3, 0)$  and  $C(4, 4, 0)$   
 All the points lie on  $xy$  plane.  $Z$  component is zero  
 $\therefore$  Equation of  $xy$  plane:  $z = 0$

Ans.58(A) The correct answer is **option 1** i.e. **58500**  
 For first two digits, 26 alphabets are there  
 Choosing two out of 26 and arranging  
 $= {}^{26}P_2 = \frac{26!}{24!} = 650$   
 Choosing two out of 10 numbers  
 $= {}^{10}P_2 = \frac{10!}{8!} = 90$

Ans.59(C) Total number of ways =  $650 \times 90 = 58500$   
 In given function,  $x - 2 \geq 0$  because  $\sqrt{x}$  has a domain of only positive number  
 $\therefore x \geq 2$

Also denominator should not be zero finding values for which denominator is zero  
 $x^2 - 16x + 63 = 0$   
 $x^2 - 7x - 9x + 63 = 0$   
 $x(x - 7) - 9(x - 7) = 0$   
 $(x - 9)(x - 7) = 0$   
 It is zero for  $x = 9$  and  $7$   
 $\therefore$  Domain =  $[2, \infty) - \{7, 9\}$

Ans.60(C) Every term is of form  
 $T \equiv \sin\{x \pi/4\} \sin\{(x + 1) \pi/4\} + \cos\{x \pi/4\} \cos\{(x + 1) \pi/4\}$   
 Where  $x$  varies from 1 to 8  
 $\sin A \sin B + \cos A \cos B = \cos(B - A)$   
 $T \equiv \cos[(x + 1)\pi/4 - x\pi/4] = \cos \pi/4 = 1/\sqrt{2}$   
 Sum of 8 such terms =  $8/\sqrt{2} = 4\sqrt{2}$   
 $4\sqrt{2} = \sqrt{n}$   
 squaring on both sides  
 $n = 32$

Ans.61(D) Magnitude of a unit vector = 1  
 $\therefore \sin^2 A + \sin^2 B = 1$   
 $\sin^2 A = \cos^2 B [\because 1 - \sin^2 x = \cos^2 x]$   
 $\sin A = \pm \cos B$

Ans.62(A)  $\sin A = \sin(\pi/2 \pm B)$   
 $A = \pi/2 \pm B$   
 $A \pm B = \pi/2$   
 $0 \leq P(E) \leq 1$   
 $0 \leq \{P(E)\}^2 \leq 1$   
 $0 \leq x^2 + 1/4 \leq 1$   
 $0 \leq x^2 \leq 3/4 [\because x^2 \text{ is non-negative}]$   
 $\therefore x$  belongs to  $[-\sqrt{3}/2, \sqrt{3}/2]$   
 Ans.63(C)  $\sin A + \sin B = 2 \sin \frac{A+B}{2} \cdot \cos \frac{A-B}{2}$   
 $\sin 2x + \sin 6x = 2 \sin 4x \cos 2x$   
 $\sin 2x + 2 \sin 4x + \sin 6x = 2 \sin 4x \cos 2x + 2 \sin 4x$   
 $2 \sin 4x (\cos 2x + 1)$   
 $1 + \cos 2x = 2 \cos^2 x$   
 $\sin 4x = 2 \sin 2x \cos 2x = 4 \sin x \cos x \cos 2x$   
 $\therefore 2 \sin 4x (\cos 2x + 1) = 8 \sin x \cos x \cos 2x$   
 $(\cos 2x + 1) = 16 \sin x \cos^3 x \cos 2x$   
 $k = 16$

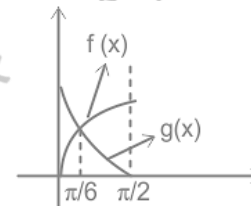
Ans.64(C)  $\frac{dy}{dx} - y = e^x$   
 $e^{-x} \frac{dy}{dx} - e^{-x} y = 1$   
 $\frac{d(e^{-x} y)}{dx} = 1$   
 $\int d(e^{-x} y) = \int d(x)$   
 $e^{-x} y = x + C$   
 $Y = x e^x + C e^x$

Ans.65(C) According to Demorgan law,  
 $E' \cap F' = (E \cup F)'$

Ans.66(B)  $r = a_0 n^2$ , where  $a_0$  = radius of first orbit  
 $\therefore k = 2$

Ans.67(C) In an intrinsic semiconductor, the number density of holes = Number density of electrons  
 $\therefore$  Number density of electrons =  $5 \times 10^{34}/m^3$

Ans.68(C)



$f(x)$  and  $g(x)$  meet at  
 $\sin x = 1 - \sin x$   
 $\Rightarrow 2 \sin x = 1$   
 $\Rightarrow \sin x = 1/2$   
 $\Rightarrow x = \pi/6$

Area =  $\int \{f(x) - g(x)\} dx$   
 $= \int_{\pi/6}^{\pi/2} (2 \sin x - 1) dx$

$= -2 \cos x - x \Big|_{\pi/6}^{\pi/2}$   
 $= -\pi/2 - [-\sqrt{3} - \pi/6]$   
 $= \sqrt{3} - \pi/3$  sq. units

Ans.69(B)  $\int e^x (\tan^2 x + 2 \tan^3 x + 2 \tan x) dx$   
 $= \int e^x \{\tan^2 x + 2 \tan x (\tan^2 x + 1)\} dx$   
 $= \int e^x \{\tan^2 x + 2 \tan x \sec^2 x\} dx$   
 $[\because 1 + \tan^2 x = \sec^2 x]$   
 $= \int e^x \{\tan^2 x + 2 \tan x \sec^2 x\} dx$   
 Let  $\tan^2 x = f(x)$  then  $f'(x) = 2 \tan x \sec^2 x$   
 $= \int e^x \{f(x) + f'(x)\} dx$   
 $= e^x f(x) + C$   
 $= e^x \tan^2 x + C$

Ans.70(C)  $\frac{dy}{dx} = 2 \cos^2 x \cos^2 y + 4 \cos^2 y$   
 $\frac{dy}{dx} = (2 \cos^2 x + 4) \cos^2 y$   
 $\frac{dy}{\cos^2 y} = (2 \cos^2 x + 4) dx$   
 $\sec^2 y dy = (\cos 2x + 5) dx$  [ $\cos 2x = 2 \cos^2 x - 1$ ]  
 Integrating  
 $\tan y = \sin 2x/2 + 5x + C$



TEST FORM NUMBER

## INSTRUCTIONS TO CANDIDATE

अधिकतम अंक : 70

कुल प्रश्न : 70

निर्धारित समय : 45 मिनट

**प्रश्नों को हल करने से पहले निम्नलिखित निर्देशों को ध्यान से पढ़ें।**

(1) इस पुस्तिका में 70 प्रश्न हैं, जो कि कुल तीन भागों में विभाजित हैं।

भाग- (I) : English

(20 प्रश्न)

भाग- (II) : Physics

(25 प्रश्न)

भाग -(III) : Math

(25 प्रश्न)

(2) सभी प्रश्न अनिवार्य हैं तथा सबके बराबर अंक हैं।

(3) प्रश्नों को हल करना प्रारम्भ करने से पहले आपको इस पुस्तिका की जांच करनी चाहिए और यह सुनिश्चित करना चाहिए कि इसमें सभी पृष्ठ उपस्थित हैं और कोई पृष्ठ कम या बदला हुआ नहीं है। अगर आपको इस पुस्तिका में कोई दोष मिलता है, तो आपको तुरंत इसे बदलना होगा।

(4) किसी प्रश्न में नकारात्मक अंकन नहीं है।

(5) आपको निरीक्षक द्वारा उत्तर पुस्तिका अलग से दी जाएगी। आपको प्रश्नों को हल करना प्रारम्भ करने से पहले अपना नाम, रोल नंबर, टेस्ट नाम /आईडी और/परीक्षा का नाम उत्तर-पुस्तिका पर सावधानीपूर्वक पूरा करना होगा। आपको उत्तर-पुस्तिका में निर्धारित स्थान पर अपना हस्ताक्षर भी करना होगा। इन निर्देशों का पूरी तरह से पालन किया जाना चाहिए, जिसको न करने पर आपकी उत्तर-पुस्तिका का मूल्यांकन नहीं किया जाएगा और आपको 'शून्य' अंक दिया जाएगा।

(6) उत्तर केवल **पेंसिल** या **ब्लैक/ब्लू बॉल पेन** द्वारा उत्तर- पुस्तिका प्रासंगिक प्रश्न संख्या के सम्बंधित गोले को पूरी तरह से ब्लैक करके दिखाया जाना चाहिए।

(7) OMR उत्तर पुस्तिका को एक मशीन द्वारा जांचा जायेगा। यदि किसी स्थिति में उपलब्ध जानकारी, आवेदन पत्र में दी गयी जानकारी से अलग पायी गयी, तो आवेदक का आवेदन निरस्त कर दिया जायेगा।

(8) निरीक्षक की अनुमति मिलने के बाद ही कोई परीक्षा कक्ष छोड़ सकता है।

(9) उपरोक्त में से किसी भी निर्देश का अनुपालन करने में विफल उम्मीदवार को उपयुक्त कार्यवाही/जुर्माना के लिए उत्तरदायी समझा जा सकता है।

(10) जितनी जल्दी हो सके उतनी जल्दी और सावधानी से प्रश्नों का उत्तर दें। कुछ सवाल कठिन हो सकते हैं और दूसरे आसान हो सकते हैं। किसी भी प्रश्न पर ज्यादा समय नहीं बिताएं।

(11) मोबाइल फोन और वायरलेस संचार उपकरण, परीक्षा कक्ष/कमरे में पूरी तरह से प्रतिबंधित हैं। कोई भी आवेदक अपने मोबाइल का या किसी वायरलेस संचार उपकरण को बंद करके भी अपने पास नहीं रख सकता। नियम का उल्लंघन करने पर आवेदक के विरुद्ध उचित कार्यवाही की जायेगी और उसका आवेदन भी निरस्त किया जा सकता है।

(12) उत्तर-पत्र पर कोई रफ काम नहीं किया जाना चाहिए।

(13) कोई भी उम्मीदवार परीक्षा पूरा होने से पहले परीक्षा कक्ष नहीं छोड़ सकता है।

परीक्षार्थी का नाम :.....

दिनांक :..... परीक्षा कोड :.....

अनुक्रमांक :.....

**जब तक आपको यह परीक्षण पुस्तिका खोलने को न कहा जाए तब तक न खोलें**



**ENGLISH**

**Direction (1-4):** Read the passage given below and answer the questions that follow:

Kashmir is known or said as the land of heaven. Nature over there gives more peace of mind and the positive energy in oneself, it makes you feel fresh. Kashmir is the land of beauty. An inspiration for so much art, music, and poetry, Kashmir is paradise; a nature lover's wonderland and a shopper's dream come true. Kashmir is the best place for tourism. Kashmir is in the northwest. Jammu is the most visited part of Jammu and Kashmir State. The Mughals called Kashmir 'Paradise on Earth' where they journeyed across the hot plains of India, to the cool valleys in summer. In winter, when snow carpets the mountains and everywhere is snow and snow, there is skiing, tobogganing, sledge-riding, etc. along the high slopes. In the spring and summer seasons, the beauty of Kashmir is at its peak. During summer seasons, the whole valley is a mosaic of varying shades of green trees, rice fields, meadows, trees, etc.

- When the beauty of Kashmir is at its peak?  
(A) In spring and winter seasons  
(B) In rainy and summer seasons  
(C) In spring and rainy seasons  
(D) In spring and summer seasons
- Which of the following words could replace the word 'paradise' as used in the passage?  
(A) Dormitory (B) Hell  
(C) Zion (D) Nadir
- Which place is the most visited place according to the passage?  
(A) Jammu (B) Kashmir  
(C) Northeast (D) Northwest
- Who called Kashmir 'Paradise on Earth'?  
(A) Mourya (B) Mughal  
(C) Maratha (D) British
- Change the voice:  
I shall have written the letter to my father.  
(A) The letter will be written by me to my father.  
(B) The letter will have been written by me to my father.  
(C) The letter would have been written by me to my father.  
(D) The letter will have written by me to my father.
- Identify the correctly spelt word:  
(A) sensasion (B) sansassion  
(C) sansation (D) sensation
- Select the word which means the same as the group of words given.  
The action of driving or pushing forward  
(A) Propulsion (B) Astern  
(C) Astute (D) Dominion
- Given below are four jumbled sentences. Pick the option that gives their correct order.  
India must  
P. approach with regard  
Q. to her security problems.  
R. adopt a bellicose  
(A) RQP (B) RPQ  
(C) PQR (D) QPR

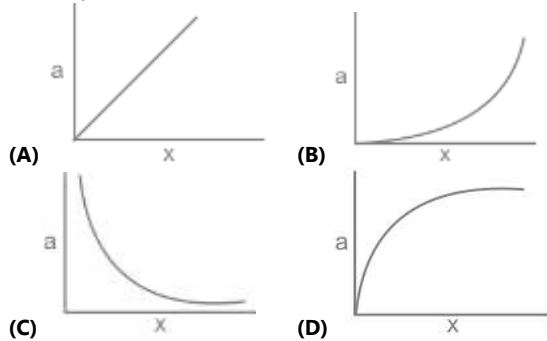
- Spot the erroneous parts, if any, in the following sentences:  
Ten kilometers (a) / are considered (b) / very easy to travel. (c) / No Error (d)  
(A) A (B) B  
(C) C (D) D
- Spot the erroneous parts, if any, in the following sentences:  
Cauvery is known as (a) / Dakshin Ganga and is known (b) / for its sceneries and sanctity. (c) / No error (d)  
(A) A (B) B  
(C) C (D) D
- Spot the erroneous parts, if any, in the following sentences:  
Nishi along with her (a) / sister Nipu are planning (b) / to go to Darjiling (c) / No error (d)  
(A) A (B) B  
(C) C (D) D
- A sentence, split into four parts, has been given. Choose the best order which produces the original sentence:  
behaviour in (1) / this matter (2) / I can't account (3) / for his usual (4)  
(A) 1324 (B) 3412  
(C) 3214 (D) 4321
- Choose the most appropriate answer and fill in the blanks:  
The Noun form of 'protect' is, \_\_\_\_\_.  
(A) Protecting (B) Protective  
(C) Protection (D) Protector
- Choose the most appropriate answer and fill in the blanks:  
He is unlikely to come to the party but \_\_\_\_\_ I would talk to him.  
(A) if he is to come (B) if he comes  
(C) if he would come (D) if he will come
- Choose the most appropriate answer and fill in the blanks:  
\_\_\_\_\_, had made an attempt.  
(A) All but her (B) All but herself  
(C) All but hers (D) All but she
- Choose the most appropriate answer and fill in the blanks:  
The player \_\_\_\_\_ has scored a century in the match is my brother.  
(A) Which (B) Whom  
(C) Who (D) Whose
- Choose the word almost opposite in meaning to the word given below:  
FLOURISH  
(A) Garnish (B) Hinder  
(C) Amplify (D) Develop
- Choose the word almost nearest in meaning to the word given below:  
INTERPID  
(A) Gallant (B) Insecure  
(C) Cowardly (D) Invisible
- Choose the option the expresses the meaning of the given Idiom.  
At large  
(A) A very big opportunity  
(B) A criminal escaped or not yet captured

- (C) To have a big heart  
(D) A big appetite

20. Choose the active sentence.  
Let the boats be lowered.  
(A) Lower the boats  
(B) The boats have to be lowered  
(C) The boats should be lowered  
(D) Please lower the boat

## PHYSICS

21. यदि एक बल क्षेत्र में किसी निकाय की संभावित ऊर्जा शून्य क्षमता से सीधे विस्थापन (x) के घन के समानुपाती है, तो निम्नलिखित में से कौन सा ग्राफ सही रूप से निकाय के त्वरण (a) और x के बीच के संबंध से संबंधित है?



22. गुरुत्वाकर्षण आकर्षण के कारण अंतरिक्ष में दो पिंड A और B चलते हैं। यदि पिण्ड A और B का द्रव्यमान 2:3 के अनुपात में है और एक विशेष समय पर उनका त्वरण क्रमशः 3 मीटर/सेकंड<sup>2</sup> और 2 मीटर/सेकंड<sup>2</sup> है, तो उस समय उनके द्रव्यमान के केंद्र का त्वरण क्या होगा? (मीटर/सेकंड<sup>2</sup> में)

- (A) 0 (B) 0.1  
(C) 1 (D) 2.8

23. 16 किलोग्राम और 1 मीटर त्रिज्या वाले डिस्क पर 64 Nm का एक टॉर्क लगाया जाता है। यदि डिस्क के तल के केंद्र और लंबवत गुजरने वाले अक्ष में यह डिस्क घूम रही है, तो डिस्क का कोणीय त्वरण क्या होगा? (रेडियन/सेकंड<sup>2</sup> में)

- (A) 2 (B) 4  
(C) 8 (D) 12

24. यदि  $f(x)$  एक निरंतर कार्य है, तो  $(a+1)$  का मान क्या है  $f(x) = \begin{cases} a+b, & x > 0 \\ -ab+2, & x \leq 0 \end{cases}$   
(A)  $b+1$  (B)  $3b$   
(C)  $3/b+1$  (D)  $4/b+1$

25. यदि  $y = x \ln x - x$ , तो  $\frac{d^2y}{dx^2} = x^N$  है, तो N का मान क्या है?

- (A) 0 (B) 1  
(C) -1 (D) 2

26.  $\int \sec^4 \theta d\theta = ?$

- (A)  $\tan^3 \theta + \tan \theta + C$  (B)  $\tan^3 \theta + \tan^2 \theta + C$   
(C)  $\tan^2 \theta / 3 + \tan^2 \theta / 2 + C$  (D)  $\tan^3 \theta / 3 + \tan \theta + C$

27. नीचे दिए गए आंकड़ों में, 10 किलो द्रव्यमान और 10 /से वेग वाला एक पिंड एक दीवार से 60° के कोण पर टकराता है। ऊर्ध्वाधर दिशा में कोई बल न मानते हुए, पिंड पर दीवार द्वारा बनाया गया आवेग क्या है? (किलोग्राम मी /से में)

- (A) 50 (B) 100  
(C) 150 (D) 200

28. 5 N के निरंतर बल के तहत एक पिंड बल की दिशा से 60° की दिशा से दूर चलता है। किया गया कार्य 100 J है। यदि समान पिंड समान दिशा में बल के रूप में ही चलता है, तो उसी विस्थापन के लिए कितनी आवश्यकता है?

- (A) 50 J (B) 100 J  
(C)  $100 \sqrt{3}$  J (D) 200 J

29. एक शरीर को 5 rad/s<sup>2</sup> का निरंतर कोणीय त्वरण दिया जाता है। यदि शरीर आरंभ से ही आराम में है, समय  $T = 5$  सेकंड में, तो क्रमशः घूर्णन की धुरी से 5 सेमी और 10 सेमी की दूरी पर मौजूद शरीर में कणों की गति का अनुपात क्या है?

- (A) 25:1 (B) 5:1  
(C) 1:2 (D) 2:1

30. निम्नलिखित में से कौन सा एक स्थिति फलन है?

- (A) गर्मी की आपूर्ति (B) किया गया कार्य  
(C) आंतरिक ऊर्जा (D) निम्न में से कोई नहीं

31.  $y = A \sin \omega t$  और  $y = A \sin (\omega t + \pi/3)$  सुपरइम्पोजिंग पर प्राप्त परिणामी तरंग का आयाम क्या है?

- (A) A (B)  $\sqrt{2}A$   
(C)  $\sqrt{3}A$  (D) 2A

32. वसंत-मास प्रणाली को निष्पादित करने के लिए S.H.M. क्षैतिज दिशा में, x द्वारा दी गई स्थिति  $(t) = A \cos \omega t$ . ( $\omega = \sqrt{k/m}$ ) है। निम्नलिखित में से किस समय में गतिज ऊर्जा और प्रणाली की स्थितिज ऊर्जा परिमाण में समान होती है? (T = समय अवधि)

- (A) T (B) T/2  
(C) T/4 (D) T/8

33. निम्नलिखित में से कौन एक व्यापक गुण है?

- (A) ताप क्षमता (B) दबाव  
(C) तापमान (D) मोलर की मात्रा

34. एक वास्तविक ऊष्मा इंजन का उपयोग कुछ काम करने के लिए किया जाता है जो 50% उतना ही कुशल होता है जितना कि एक ही स्रोत और सिंक तापमान के साथ काम करने वाला एक कार्नोट इंजन। यदि स्रोत और सिंक तापमान 727° C और 27° C हैं और स्रोत से आपूर्ति की जाने वाली ऊष्मा की मात्रा 200 जूल है, तो इंजन द्वारा किए गए कार्य की मात्रा क्या होगी?

- (A) 140 जूल (B) 180 जूल  
(C) 70 जूल (D) 90 जूल

35. दो नई गैसों A और B पाई जाती हैं। दोनों को एक ही तापमान पर बनाए रखा जाता है और यह पाया जाता है कि A और B के मूल माध्य वर्ग वेग का अनुपात 3 : 1 है। A और B के आणविक द्रव्यमान का अनुपात क्या होगा?

- (A) 3 : 1 (B) 1 : 3  
(C) 9 : 1 (D) 1 : 9

36. किसी विशेष आवेश प्रणाली के चारों ओर अभिन्न सतह, \_\_\_\_\_ पर निर्भर करती है

- (A) बंद सतह का आकार  
(B) सतह की त्रिज्या / आयाम  
(C) आवेश के आसपास के माध्यमों के प्रकार  
(D) उपरोक्त सभी

37. 2 सेमी त्रिज्या वाले एक गोलाकार और एकसमान आवेश घनत्व 3 mC/m<sup>2</sup> प्रदान की जाती है। शेल के अंदर 1 मिमी की दूरी पर 1 μC के आवेश को स्थानांतरित करने में क्या कार्य किया जाता है?

- (A) 10<sup>-6</sup> J  
(B) 10<sup>-4</sup> J  
(C) 0 J  
(D) अनुमान नहीं लगाया जा सकता है

38. अर्धचालक में तापमान में वृद्धि के साथ प्रतिरोध में कमी के पीछे उचित कारण कौन सा है?

- (A) आवेश वाहकों की संख्या बढ़ जाती है जो विश्राम के समय को कम हो जाती है  
(B) आवेश वाहकों की संख्या घट जाती है जो विश्राम के समय में वृद्धि से प्रबल होती है  
(C) आवेश वाहक और विश्राम समय दोनों की संख्या बढ़ जाती है  
(D) आवेश वाहक और विश्राम समय दोनों की संख्या घट जाती है

39. चुंबकीय क्षण का आयामी सूत्र क्या है?

- (A)  $[ML^2TA^2]$  (B)  $[M^0L^2T^0A]$   
(C)  $[M^0L^2T^1A]$  (D)  $[M^0L^2T^2A]$

40. कोणीय आवृत्ति के AC स्रोत के साथ एक LCR श्रृंखला सर्किट में (L = प्रेरकत्व, C = धारिता और R = प्रतिरोधक), तो प्रतिध्वनि के दौरान XL to XC का अनुपात क्या है?  
(A) L/C (B) C/L  
(C)  $\omega C/L$  (D) 1
41. अवतल दर्पण में, दर्पण से 15 सेमी की दूरी पर रखी गई वस्तु दर्पण से 15 सेमी या अधिक दूरी पर रखे जाने पर एक प्रतीयमान छवि और वास्तविक छवि बनाती है। दर्पण से किस दूरी पर वस्तु को ऐसे रखा जाना चाहिए कि आवर्धन 1 हो जाए?  
(A) 15 सेमी. (B) 7.5 सेमी.  
(C) 30 सेमी. (D) 60 सेमी.
42.  $\lambda$  मीटर तरंग दैर्घ्य की हल्की तरंगें दरार के आकार से मीटर प्रबुद्ध होती हैं, तो z द्वारा दी फ्रेस्नेल दूरी का मान क्या है?  
(A)  $a/\lambda$  (B)  $\lambda/a$   
(C)  $a^2/\lambda$  (D)  $\lambda^2/a$
43. यदि टार्क (T), द्रव्यमान (M) और कोणीय संवेग (P) माप की बुनियादी इकाइयाँ हैं, तो निम्न में से कौन सी दूरी की माप की इकाई है?  
(A)  $P/\sqrt{(TM)}$  (B)  $\sqrt{PT/M}$   
(C)  $P\sqrt{(T/M)}$  (D)  $\sqrt{(TM)}/P$
44. निम्नलिखित में से कौन सा विकल्प प्रौद्योगिकी और शासकीय वैज्ञानिक सिद्धांतों का गलत संयोजन है?  
(A) सोनार - अल्ट्रासोनिक तरंगों का परावर्तन  
(B) स्टीम इंजन - ऊष्मागतिकी के नियम  
(C) रॉकेट प्रणोदन - न्यूटन का गति का नियम  
(D) विद्युत जनरेटर - बायोट सैवर्ट का नियम
45. शुरुआत में 5 मीटर/सेकंड की गति के साथ एक निकाय के मंदन की दर सीधे वेग के वर्ग के आनुपातिक है। यदि 24 सेकंड के अंत में गति 1 मीटर/सेकंड है, तो 54 सेकंड के अंत में गति क्या होगी? (मीटर/सेकंड में)  
(A) 0.2 (B) 0.4  
(C) 0.5 (D) 0.8

### MATH

46. एक  $4 \times 4$  मैट्रिक्स का प्रत्येक तत्व दोगुना किया जाता है। यदि प्रारंभ में मैट्रिक्स का विविक्तकर मान (discriminant value) D था, तो दोहराकरण के बाद विविक्तकर मान क्या होगा?  
(A) 4D (B) 2D  
(C) 8D (D) 16D
47. एक बैग में तीन सिक्के हैं। उनमें से दो के साथ कुछ इस प्रकार छेड़छाड़ की जाती है कि जब सिक्के उछाले जाते हैं तो हेड आने की प्रायिकता क्रमशः 2/3 और 5/6 होती है। तीसरा सिक्का एक सामान्य सिक्का है। X एक सिक्के को यादृच्छिक रूप से चुनता है और इसे उछालता है। हेड आने की प्रायिकता क्या होगी?  
(A) 2/3 (B) 5/6  
(C) 6/7 (D) 11/18
48. हाइड्रोजन परमाणु में  $n = 3$  to  $n = 2$  से इलेक्ट्रॉन के संचरण से उत्सर्जित तरंगों की तरंग क्रमांक क्या है? रिडबर्ग कांस्टेंट का उपयोग करे  $R = 1.097 \times 10^7 \text{ m}^{-1}$   
(A)  $1.522 \times 10^6 \text{ m}^{-1}$  (B)  $1.255 \times 10^6 \text{ m}^{-1}$   
(C)  $1.525 \times 10^6 \text{ m}^{-1}$  (D)  $1.525 \times 10^5 \text{ m}^{-1}$
49. यदि a समुच्चय A का एक तत्व है जो सूचित करता है कि यह B का भी एक तत्व है, तो B, A का \_\_\_\_\_ है।  
(A) अधिसमुच्चय (B) उपसमुच्चय  
(C) घात कुलक (D) रिक्त समुच्चय
50. निम्नलिखित में से किस द्विघात समीकरण का एक संमिश्र मूल है?  
(A)  $7x^2 + 11x + 4$  (B)  $11x^2 + 15x + 5$   
(C)  $17x^2 + 23x + 8$  (D)  $2x^2 + 17x + 34$
51. यदि एक फोकस के निर्देशांक और और एक अनुवृत्त के शीर्ष क्रमशः (8, 1) और (3, 0) हैं, तो अनुवृत्त के नियता का समीकरण क्या है?

- (A)  $y + 5x = -9$  (B)  $5x + y = -11$   
(C)  $5y + x = -9$  (D)  $x + 5y = -11$
52. 81 से विभाजित होने पर  $10^{n+1} - 9n$  का शेष क्या है, जहां n एक प्राकृतिक संख्या है?  
(A) 1 (B) 9  
(C) 10 (D) 12
53. निम्नलिखित आंकड़े समुच्चय में बहुलक- माधिका का मान क्या है?  
7, 5, 15, 23, 55, 67, 23, 21, 85, 65, 55, 21, 67, 55, 11, 3, 7  
(A) 25 (B) 34  
(C) 38 (D) 42
54. A एक पंक्ति आव्यूह है और B एक स्तंभ आव्यूह है जैसे कि,  $AB = C$ . C में कितने तत्व हैं?  
(A) 1  
(B)  $n^2$ , जहाँ  $n = A$  में स्तंभों की संख्या  
(C)  $m^2$ , जहाँ  $m = B$  में पंक्तियों की संख्या  $n^2$   
(D)  $n \times m$ , जहाँ  $n = A$  स्तंभों की संख्या और  $m = B$  में पंक्तियों की संख्या
55. यदि A,  $3 \times 3$  आव्यूह है जैसे कि आव्यूह के तत्व  $a_{ij} = |i - j|$  द्वारा दिए गए हैं, तो  $|A|$  का मान क्या है?  
(A) 0 (B) 2  
(C) 4 (D) 6
56.  $|\text{adj}(A)|$  यदि  $|A| = 3$  क्या है?  
(A) 3 (B) 1/3  
(C) 1 (D) उपरोक्त में से कोई नहीं
57. समतल का समीकरण क्या है जो निम्नलिखित बिंदुओं से होकर गुजरता है?  
A (1, 2, 0), B (2, 3, 0) और C (4, 4, 0)  
(A)  $x - y + z + 1 = 0$  (B)  $z = 0$   
(C)  $x + y - z + 1 = 0$  (D)  $x - y + z = 0$
58. एक कंपनी कर्मचारी संख्या बनाने के लिए निम्नलिखित कोड का उपयोग करती है। इसमें चार अंक होते हैं। पहले दो अक्षर हैं जो समान अक्षर नहीं होने चाहिए। अंतिम दो अंक संख्यात्मक हैं और पुनः समान संख्या को दोहराया नहीं जा सकता है। ऐसी कितनी कर्मचारी संख्या बनाई जा सकती है?  
(A) 58500 (B) 55800  
(C) 65800 (D) 65000
59. निम्नलिखित फलन का डोमेन क्या होगा?  
$$\frac{\sqrt{x-2}}{x^2 - 16x + 63}$$
  
(A) R (B)  $[2, \infty) - \{7\}$   
(C)  $[2, \infty) - \{7, 9\}$  (D)  $R - \{7, 9\}$
60.  $\left(\sin \frac{\pi}{4} \sin \frac{2\pi}{4} + \cos \frac{\pi}{4} \cos \frac{2\pi}{4}\right) + \left(\sin \frac{2\pi}{4} \sin \frac{3\pi}{4} + \cos \frac{2\pi}{4} \cos \frac{3\pi}{4}\right) + \dots + \left(\sin \frac{8\pi}{4} \sin \frac{9\pi}{4} + \cos \frac{8\pi}{4} \cos \frac{9\pi}{4}\right) = \sqrt{n}$  है, तो n का मान क्या होगा?  
(A) 8 (B) 16  
(C) 32 (D) 64
61. यदि सदिश P एक इकाई सदिश है तो कोण A और B के बीच में निम्न में से कौन सा एक संभावित संबंध है?  $P = \sin A \hat{i} + \sin B \hat{j}$   
(A)  $A + B = \pi/2$  (B)  $A - B = \pi/2$   
(C)  $A = 2B$  (D) (A) और (B) दोनों
62. यदि  $P(E) = \sqrt{(x^2 + 1/4)}$  द्वारा किसी वृत्त की प्रायिकता E दी जाती है, तो x का संभावित मान क्या है?  
(A)  $(-\sqrt{3}/2, \sqrt{3}/2)$  (B)  $[-\sqrt{3}/2, \sqrt{3}/2]$   
(C)  $R - (-\sqrt{3}/2, \sqrt{3}/2)$  (D)  $R - [-\sqrt{3}/2, \sqrt{3}/2]$
63.  $\sin 2x + 2 \sin 4x + \sin 6x = k(\sin x \cdot \cos^2 x \cdot \cos 2x)$ , k का मान क्या है?  
(A) 4 (B) 8  
(C) 16 (D) 32



64.  $dy/dx - y = ex$  है, तो  $y$  का मान ज्ञात करें?  
 (A)  $xe^x + C$  (B)  $xe^{-x} + C$   
 (C)  $xe^x + Ce^x$  (D)  $xe^{-x} + Ce^{-x}$
65. निम्नलिखित में से कौन-सा डेमॉर्गन नियम के अनुसार सही है?  
 (A)  $E' \cap F = (E \cup F)'$  (B)  $E' \cup F = (E \cup F)'$   
 (C)  $E' \cap F' = (E \cup F)'$  (D)  $E' \cup F' = (E \cup F)'$
66. बोहर (बोर) के मॉडल के अनुसार एक हाइड्रोजन परमाणु में कक्षा की त्रिज्या  $n^{\text{th}}$ ,  $n^k$  के समानुपाती है, तो  $k$  का मान क्या है?  
 (A) 1 (B) 2  
 (C)  $\frac{1}{2}$  (D)  $-\frac{1}{2}$
67. एक आंतरिक अर्धचालक में, छिद्रों की संख्या का घनत्व  $5 \times 10^{34}/\text{m}^3$  है, तब इलेक्ट्रॉनों की संख्या के घनत्व के बारे में निम्नलिखित में से कौन सा सही है?  
 (A)  $< 5 \times 10^{34}/\text{m}^3$  (B)  $> 5 \times 10^{34}/\text{m}^3$   
 (C)  $= 5 \times 10^{34}/\text{m}^3$  (D) कोई सहसंबंध नहीं है
68.  $f(x) = \sin x$  और  $g(x) = 1 - \sin x$  द्वारा  $x = \pi/6$  से  $x = \pi/2$  तक घेरे गए क्षेत्र का क्षेत्रफल (वर्ग इकाई में) ज्ञात करें?  
 (A)  $\sqrt{3} - \pi/6$  (B)  $\sqrt{3} - \pi/2$   
 (C)  $\sqrt{3} - \pi/3$  (D)  $\sqrt{3} - \pi/\sqrt{3}$
69.  $\int e^x (\tan^2 x + 2\tan^3 x + 2\tan x) dx = ?$   
 (A)  $e^x \sec^2 x + c$  (B)  $e^x \tan^2 x + c$   
 (C)  $e^x \tan x + c$  (D)  $e^x \sec x + c$
70. निम्नलिखित में से कौन सा अवकल समीकरण का हल है?  
 $\frac{dy}{dx} = 2\cos^2 x \cos^2 y + 4\cos^2 y$   
 (A)  $\tan y = \sin 2x + 5x/2 + c$  (B)  $\sec y = \sin 2x + 5x/2 + c$   
 (C)  $\tan y = \sin 2x/2 + 5x + c$  (D)  $\sec y = \sin 2x/2 + 5x + c$

Space for rough work

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**ENGLISH**

- Ans.1(D)** In spring and summer seasons.  
It is clearly mentioned in the passage that "In spring and summer seasons, the beauty of Kashmir is at its peak".  
**Hence, the chosen option is correct.**
- Ans.2(C)** Zion.  
Zion- the heavenly city or kingdom of heaven.  
Paradise- (in some religions) heaven as the ultimate abode of the just.  
Dormitory- a large bedroom for a number of people in a school or institution.  
Hell- a place regarded in various religions as a spiritual realm of evil and suffering.  
Nadir- the lowest or most unsuccessful point in a situation.  
**As the given word in the question has the same meaning as the word chosen from the option it will be our right answer.**
- Ans.3(A)** Jammu.  
It is clearly mentioned in the passage that Kashmir is in the northwest Jammu is the most visited part of Jammu and Kashmir State.  
So, the chosen option is correct.  
**Hence, the chosen option is correct.**
- Ans.4(B)** Mughal.  
It is clearly mentioned in the 2nd paragraph of the passage that Mughals called Kashmir 'Paradise on Earth'.
- Ans.5(B)** If the active sentence is - subject + shall/will + have + v3 + object + other words.  
Then passive voice will be- object + shall/will+ have + been + v3 + by + subject + other words.  
**As the chosen option follows this structure so this will be our correct answer.**
- Ans.6(D)** Sensation- a physical feeling or perception resulting from something that happens to or comes into contact with the body.
- Ans.7(A)** Propulsion- the action of driving or pushing forwards.  
Dominion- sovereignty or control.  
Astern- behind or toward the rear of a ship or aircraft.  
Astute- very clever; good at judging people or situations.  
**As the chosen option expresses the best meaning of the given group of the word it will be correct.**
- Ans.8(B)** The easiest way of solving this section is to find a pair.  
• The first pair will be "must adopt" means sentence will start with R.  
• The second pair will be "bellicose approach" means RP.  
• Now the construction will be RPQ.  
The correct arrangement will be-  
**India must adopt a bellicose approach with regard to her security problems.**
- Ans.9(B)** Whenever distance is considered as a single unit we take it as a singular noun.  
• So, the verb used for it will also be singular.  
The correct sentence will be-  
**Ten kilometers is considered very easy to travel.**
- Ans.10(C)** Some Nouns like "scenery, poetry, luggage, baggage" are always used in the singular form.  
So, we need to replace Sceneries with Scenery for making the sentence grammatically correct.  
The correct sentence will be-  
**Cauvery is known as Dakshin Ganga and is known for its scenery and sanctity.**

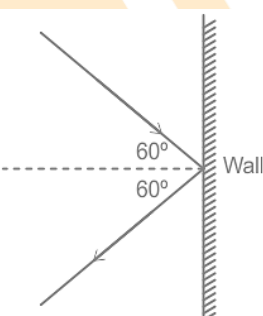
- Ans.11(B)** If two nouns are joined with **as well as, along with, accompanied by, together with**, the first Noun is considered as the subject of the sentence and verb is used according to it.  
• So, we need to replace **Are** with **Is** because the subject of the verb is Nishi that is singular.  
The correct sentence will be-  
**Nishi along with her sister Nipu is planning to go to Darjeeling.**
- Ans.12(B)** The easiest way of solving this section is to find a pair.  
• The first pair will be "account for" means 34.  
• The second pair will be usual behaviour" means 41.  
• Now the final construction will be- 3412.  
The correct arrangement will be-  
**I can't account for his usual behaviour in this matter.**
- Ans.13(C)** The correct answer is option 3 i.e. **Protection**.  
The Noun form of Protect will be **Protection**.  
VERB + ION - NOUN is formed.  
Protect + ion- Protection.  
**Hence, the chosen option will be correct.**
- Ans.14(B)** As all verbs used in the statement are in the present we need to keep the coming verb in the same tense.  
• As the chosen option is in the present tense it will be correct.  
The correct sentence will be-  
**He is unlikely to come to the party but if he comes I would talk to him.**
- Ans.15(D)** As we need **subject** here we need to choose a **subjective case**.  
• As the chosen option is the **subjective case** it will be correct.  
The correct sentence will be-  
**All but she had made an attempt.**
- Ans.16(C)** In the case of relative pronoun, we need to look at the antecedent coming before it  
• "Who" is used for a person.  
• "which" is used for non-living things.  
• As the player is a person we have to use "who" for it.  
The correct sentence will be-  
**The player who has scored a century in the match is my brother.**
- Ans.17(B)** Flourish- (of a living organism) grow or develop in a healthy or vigorous way, especially as the result of a particularly congenial environment.  
Garnish- decorate or embellish (something, especially food).  
Hinder- make it difficult for (someone) to do something or for (something) to happen.  
Amplify- increase the volume of (sound), especially using an amplifier.  
Develop- grow or cause to grow and become more mature, advanced, or elaborate.  
**As the chosen word expresses the opposite meaning of the given word it will be our correct answer.**
- Ans.18(A)** Intrepid- fearless; adventurous (often used for rhetorical or humorous effect).  
Gallant- (of a person or their behaviour) brave; heroic.  
Insecure- not firm or fixed; liable to give way or break.  
Cowardly- lacking courage.  
Invisible- unable to be seen.  
**As the chosen option best expresses the meaning of the given word so, this will be our right answer.**
- Ans.19(B)** The meaning of the given idiom is-



**At large-** a criminal escaped or not yet captured.  
**As the meaning of the given idiom is the same as the chosen option it will be the correct answer.**

- Ans.20(A)** If the passive voice is- let + subject + be + v3.  
 Then the active voice will be- v1 + subject.  
**As the given structure is followed by the chosen option it will be the right choice.**

## PHYSICS

- Ans.21(B)** क्षमता  $V(x) \propto x^3$   
 $V = kx^3$   
 बल =  $-dV/dx$   
 $\Rightarrow -3kx^2$   
 त्वरण =  $F/m$   
 $\Rightarrow -3k/m \times x^2$   
 यह एक परवलय है  
 जब  $a \propto x^2$
- Ans.22(A)** चूंकि गुरुत्वाकर्षण आकर्षण एक आंतरिक शक्ति है, इसलिए यह द्रव्यमान के केंद्र को त्वरित नहीं कर सकता है  
 इसलिए द्रव्यमान के केंद्र का त्वरण = 0 मीटर/सेकंड<sup>2</sup>
- Ans.23(C)** टार्क = जड़त्वाघूर्ण  $\times$  कोणीय त्वरण  
 $64 = 1/2 \times Mr^2 \times \text{कोणीय त्वरण}$  [∵ वृत्तीय डिस्क का जड़त्वाघूर्ण =  $1/2 \times Mr^2$ ]  
 $64 = 1/2 \times 16 \times 1^2 \times \text{कोणीय वेग}$   
 $64 = 8 \times \text{कोणीय वेग}$   
 कोणीय वेग = 8 रेडियन/सेकंड<sup>2</sup>
- Ans.24(C)**  $\lim_{x \rightarrow 0^-} f(x) = \lim_{x \rightarrow 0^+} f(x) = f(0)$   
 $a + b = -ab + 2$   
 $a + b + ab = 2$   
 $a + b + ab + 1 = 3$   
 $a(b+1) + 1(b+1) = 3$   
 $a+1 = 3/(b+1)$
- Ans.25(C)**  $\frac{dy}{dx} = x \cdot \frac{1}{x} + \ln x - 1 = \ln x$   
 $\frac{d^2y}{dx^2} = \frac{1}{x} = x^{-1}$   
 $N = -1$
- Ans.26(D)**  $\sec^4 \theta = \sec^2 \theta \times \sec^2 \theta = (\tan^2 \theta + 1) \sec^2 \theta$   
 $\therefore \int (\tan^2 \theta + 1) \sec^2 \theta d\theta$   
 माना  $\tan \theta = t \Rightarrow \sec^2 \theta d\theta = dt$   
 $\therefore I = \int (t^2 + 1) dt = \frac{t^3}{3} + t + C$   
 $= \tan^3 \theta / 3 + \tan \theta + C$
- Ans.27(B)**
- 
- माना सकारात्मक दिशा के रूप में दीवार से दूर दिशा आवक वेग  
 वेग का क्षैतिज घटक =  $-v \cos \theta$   
 $\Rightarrow -10 \times \cos 60^\circ = -5 \text{ m/s}$   
 बाह्य वेग  
 वेग का क्षैतिज घटक =  $v \cos \theta$   
 $\Rightarrow 10 \times \cos 60^\circ = 5 \text{ m/s}$   
 आवेग = गति में परिवर्तन  
 $\Rightarrow m(V_{\text{out}} - V_{\text{in}})$   
 $\Rightarrow 10 \times (5 + 5) = 100 \text{ kg m/s}$
- Ans.28(D)**  $W = Fs \cos \theta$   
 समान विस्थापन के लिए,  $W \propto \cos \theta$   
 $W_1/W_2 = \cos 60^\circ / \cos 0^\circ$  [∵ समान दिशा,  $\theta = 0^\circ$ ]  
 $100/W_2 = 1/2$   
 $W_2 = 200 \text{ J}$

- Ans.29(C)** गति,  $v = \omega r$   
 समान शरीर पर कणों के लिए,  $\omega$  समान है  
 $\therefore v \propto r$   
 $v_1/v_2 = r_1/r_2$   
 $\Rightarrow (5/10) = 1/2$   
 आवश्यक अनुपात = 1 : 2
- Ans.30(C)** स्थिति फलन वे चर हैं जो केवल थर्मोडायनामिक प्रणाली के प्रारंभिक एवं अंतिम बिंदु पर निर्भर करते हैं, न कि लिए गए पथ पर किया गया कार्य और ताप की आपूर्ति लिए गए मार्ग पर निर्भर करती है लेकिन आंतरिक ऊर्जा केवल प्रारंभिक एवं अंतिम तापमान पर निर्भर करती है।  
 $\therefore$  यह एक स्थिति फलन है
- Ans.31(C)**  $y_{\text{resultant}} = y_1 + y_2$   
 $\Rightarrow A \sin \omega t + A \sin (\omega t + \pi/3)$   
 $\Rightarrow 2A \sin (\omega t + \pi/6) \cos (\pi/6)$  [∵  $\sin A + \sin B = 2 \sin \{(A+B)/2\} \cos \{(A-B)/2\}$ ]  
 आयाम =  $2A \cos (\pi/6)$   
 $\Rightarrow 2 \times A \times \sqrt{3}/2 = \sqrt{3} A$   
 $x = A \cos \omega t$   
 $v = dx/dt = -A \omega \sin \omega t$   
 गतिज ऊर्जा = स्थितिज ऊर्जा  
 $1/2 mv^2 = 1/2 kx^2$   
 $1/2 m \times A^2 \times \omega^2 \times \sin^2 \omega t = 1/2 \times k \times A^2 \times \cos^2 \omega t$   
 $\sin^2 \omega t = \cos^2 \omega t$  [∵  $\omega^2 = k/m$ ]  
 जब यह घटित होता है  
 $\omega t = (2n+1)\pi/4$   
 $\omega = 2\pi/T$   
 $2\pi t/T = (2n+1)\pi/4$   
 $t = (2n+1)T/8$   
 जब  $n = 0$ ,  $t = T/8$
- Ans.33(A)** ताप क्षमता: यह दिए गए मिश्रण के तापमान को  $1^\circ \text{C}$  तक बढ़ाने के लिए आवश्यक ऊष्मा है। यह पदार्थ की मात्रा पर निर्भर करती है। अधिक पदार्थ को अधिक गर्मी की आवश्यकता होगी।  
**इसलिए, यह एक व्यापक गुण है**  
**दबाव:** दबाव केवल तापमान और सामग्री के प्रकार पर निर्भर करता है  
**तापमान:** तापमान केवल दबाव और संरचना पर निर्भर करता है  
**मोलर का आयतन:** पदार्थ के 1 मोल की मात्रा। यह पदार्थ की मात्रा पर निर्भर नहीं करता है
- Ans.34(C)** एक कार्नोट के इंजन की क्षमता =  $(T_1 - T_2) / T_1$   
 तापमान K में है  
 $T_1 = 727 + 273 = 1000 \text{ K}$   
 $T_2 = 27 + 273 = 300 \text{ K}$   
 दक्षता =  $(1000 - 300) / 1000$   
 $\Rightarrow 0.7$   
 वास्तविक इंजन की क्षमता = 50% of  $0.7 = 0.35$   
 दक्षता = किया गया कार्य / ऊर्जा की आपूर्ति  
 $0.35 = \text{किया गया कार्य} / 200$   
 किया गया कार्य =  $70 \text{ J}$
- Ans.35(D)** समान तापमान के लिए, गैसों की औसत गतिज ऊर्जा समान होती है।  
 $1/2 m_a v_a^2 = 1/2 m_b v_b^2$   
 $m_a/m_b = (v_b/v_a)^2$   
 $\Rightarrow (1/3)^2 = 1/9$
- Ans.36(C)** गॉस के नियम के अनुसार,  
 $\oint E \cdot dS = q/\epsilon$   
 निरंतर  $q$  के लिए, यह केवल  $\epsilon$  पर निर्भर करता है अर्थात् आवेश के आसपास का माध्यम।
- Ans.37(C)** गोलाकार खोल के अंदर, विद्युत क्षमता स्थिर है निरंतर संभावित क्षेत्र में चार्ज को स्थानांतरित करने के लिए कोई काम नहीं किया गया।  
 $\therefore$  किया गया कार्य =  $0 \text{ J}$
- Ans.38(A)** तापमान बढ़ने पर, विश्राम का समय कम हो जाता है जो तत्व के प्रतिरोध को बढ़ाता है  
 लेकिन अर्धचालकों में, तापमान बढ़ने पर, आवेश वाहक की संख्या बढ़ जाती है जो विश्राम के समय के प्रभाव को समाप्त कर देती है और कुल प्रतिरोध को कम कर देती है
- Ans.39(B)** चुंबकीय क्षण =  $I \times \text{क्षेत्रफल}$   
 $\Rightarrow [A] \times [L^2]$   
 $\Rightarrow [M^0 L^2 T^0 A]$
- Ans.40(D)** प्रतिध्वनि के दौरान,  $X_L = X_C$

## MATH

Ans.41(C)

$\therefore X_L/X_C = 1$   
 अवतल दर्पण में, प्रतीयमान छवि तब बनती है जब वस्तु की दूरी फोकल लंबाई से कम होती है और वास्तविक छवि तब बनती है जब वस्तु की दूरी फोकल लंबाई से अधिक होती है  
 $\therefore$  तुलना,  $f = -15$  सेमी [ $\therefore$  अवतल दर्पण]  
 आवर्धन 1 है, जब वस्तु को C पर रखा जाता है  $= 2f$

Ans.42(C)

एक छिद्र के आकार का (अर्थात्, दरार या छेद) एक समानांतर किरण द्वारा प्रबुद्ध होता है जो विचलित प्रकाश को लगभग  $\lambda / a$  के कोण में भेजता है। यह अधिकतम उज्ज्वल केंद्रीय कोण के आकार का है। दूरी  $z$  की यात्रा में, विचलित किरण इसलिए चौड़ाई  $z \lambda /$  विवर्तन के कारण प्राप्त करता है। यह जानना दिलचस्प है कि विवर्तन के कारण फैलने वाले  $z$  का मान क्या एक छिद्र के आकार के बराबर हो जाता है। इस प्रकार हम लगभग  $z \lambda / a$  को समान करते हैं। इससे वह दूरी प्राप्त होती है जिसके आगे चौड़ाई के बीम का विचलन महत्वपूर्ण हो जाता है

Ans.43(A)

$z\lambda/a = a$   
 $\therefore$  फ्रेस्नेल दूरी,  $z = a^2/\lambda$   
 $T = [M^1 L^2 T^{-2}]$   
 $M = [M^1 L^0 T^0]$   
 $P = [M^1 L^2 T^{-1}]$   
 माना माप की इकाई  $[L] = T^a M^b P^c$   
 $[L] = [M^{a+b+c} L^{2a+2c} T^{-2a-c}]$   
 $M, L$  और  $T$  की घात की तुलना करने पर  
 $a + b + c = 0$  ---- 1  
 $2a + 2c = 1$   
 $\therefore a + c = 1/2$   
 समीकरण 1 में प्रतिस्थापित करने पर  
 $b + 1/2 = 1$   
 $b = -1/2$   
 $-2a - c = 0$   
 $c = -2a$   
 $a + c = 1/2$   
 $-a = 1/2$   
 $a = -1/2$   
 $c = 1$

Ans.44(D)

$\therefore [L] = T^{-1/2} M^{-1/2} P^1 = P/\sqrt{(TM)}$   
 सोनार - सोनार एक उपकरण है जो अल्ट्रासोनिक तरंगों का उपयोग करता है और इसे किसी वस्तु को ढूँढने के लिए इससे परावर्तित तरंगों को पकड़ता है।  
 स्टीम इंजन - स्टीम इंजन ऊष्मा ऊर्जा को यांत्रिक कार्य में परिवर्तित करने वाला एक उपकरण है जो उष्मागतिकी के दूसरे नियम का पालन करता है  
 रॉकेट प्रणोदन - रॉकेट प्रणोदन गति के न्यूटन के तीसरे नियम के आधार पर काम करता है, जहाँ प्रेरित करने वाले ईंधन से विपरीत प्रतिक्रिया रॉकेट प्रणोदन के लिए एक धक्का प्रदान करती है  
 इलेक्ट्रिक जनरेटर - यह विद्युत चुम्बकीय प्रेरण के सिद्धांत पर काम करता है। बायोट सैवर्ट के नियम पर नहीं

Ans.45(C)

मन्दन  $= -dv/dt$   
 दिया गया है  $-dv/dt \propto v^2$   
 $dv/dt = -kv^2$   
 $dv/(v^2) = -kdt$   
 समय  $t = 0$  से  $t = t$  से एकीकरण करने पर  
 $-1/v + 1/5 = -kt$   
 $1/v - 1/5 = kt$   
 At  $t = 24$  सेकंड,  $v = 1$  मीटर/सेकंड  
 $1/1 - 1/5 = 24k$   
 $4/5 = 24k$   
 $\therefore k = 1/30$   
 अब गति का समीकरण  
 $1/v - 1/5 = t/30$   
 For  $t = 54$   
 $1/v - 1/5 = 54/30$   
 $1/v - 1/5 = 9/5$   
 $1/v = 10/5 = 2$   
 $v = 0.5$  m/s

Ans.46(D)

$(n \times n)$  मैट्रिक्स के विविक्तकर मान का परिवर्तन जब प्रत्येक तत्व को  $k$  से गुणा किया जाता है  $= k^n \times$  मूल मैट्रिक्स का विविक्तकर मान इस स्थिति में दोहरीकरण का विविक्तकर मान  
 $= 2^4 \times D = 16D$

Ans.47(A)

कुल प्रायिकता = पहले सिक्के का चयन करने की प्रायिकता  $\times$  पहले सिक्के में हेड आने की प्रायिकता + दूसरे सिक्के के चयन की प्रायिकता  $\times$  दूसरे सिक्के में हेड आने की प्रायिकता + तीसरे सिक्के के चयन की प्रायिकता  $\times$  तीसरे सिक्के में हेड आने की प्रायिकता  
 $\Rightarrow 1/3 \times 2/3 + 1/3 \times 5/6 + 1/3 \times 1/2$   
 $\Rightarrow 2/9 + 5/18 + 1/6 = (4 + 5 + 3)/18$   
 $\Rightarrow 12/18 = 2/3$

Ans.48(A)

तरंग क्रमांक  $= R \times (1/n_2^2 - 1/n_1^2)$   
 $\Rightarrow 1.097 \times 10^7 \times (1/4 - 1/9)$   
 $\Rightarrow 1.097 \times 10^7 \times 5/36 = 1.522 \times 10^6 \text{ m}^{-1}$

Ans.49(A)

यदि  $a$  समुच्चय  $A$  का एक तत्व है जो सूचित करता है कि यह  $B$  का भी एक तत्व है,  
 तब  $A \subset B$

Ans.50(C)

$\therefore B, A$  का अधिसमुच्चय है  
 एक द्विघात समीकरण के लिए  $ax^2 + bx + c = 0$ , संमिश्र मूल रखना पड़ता है  
 $b^2 < 4ac$   
 समीकरण I:  
 $7x^2 + 11x + 4$   
 $b^2 = 121$   
 $4ac = 112$   
 $b^2 > 4ac$ ,  $\therefore$  यह संमिश्र मूल नहीं रखता है  
 समीकरण II:  
 $11x^2 + 15x + 5$   
 $b^2 = 225$   
 $4ac = 220$   
 $b^2 > 4ac$ ,  $\therefore$  यह संमिश्र मूल नहीं रखता है  
 समीकरण III:  
 $17x^2 + 23x + 8$   
 $b^2 = 529$   
 $4ac = 544$   
 $b^2 < 4ac$ ,  $\therefore$  यह संमिश्र मूल रखता है  
 समीकरण IV:  
 $2x^2 + 17x + 34$   
 $b^2 = 289$   
 $4ac = 272$   
 $b^2 > 4ac$ ,  $\therefore$  यह संमिश्र मूल नहीं रखता है

Ans.51(B)

अनुवृत्त के अक्ष पर शिखर एवं फोकस निहित है  
 अक्ष का ढलान  $= (y_2 - y_1) / (x_2 - x_1)$   
 $\Rightarrow (0 - 1) / (3 - 8) = 1/5$   
 नियता का ढलान  $= -1 / (\text{अक्ष का ढलान}) [\perp \text{ अक्ष}]$  नियता  
 नियता का ढलान  $= -5$   
 नियता का समीकरण:  $y = -5x + c$   
 माना बिंदु  $P$  की नियता पर अक्ष का मिलान होता है  
 शिखर  $P$  एवं फोकस का मध्य बिंदु है  
 माना  $P = (X, Y)$   
 शिखर,  $(3, 0) = ((x + 8) / 2, (y + 1) / 0)$  [सूत्र का मध्य भाग]  
 $x = -2, y = -1$   
 नियता समीकरण में प्रतिस्थापित  
 $-1 = 10 + c$   
 $c = -11$   
 नियता का समीकरण:  $y = -5x - 11$   
 $5x + y = -11$   
 $10 = 9 + 1$   
 $10^{n+1} = (9 + 1)^{n+1}$   
 द्विपद प्रमेय का उपयोग करते हुए  
 $10^{n+1} = {}^{n+1}C_0 + {}^{n+1}C_1 9^1 + {}^{n+1}C_2 9^2 + \dots + {}^{n+1}C_{n+1} 9^{n+1}$   
 $10^{n+1} = 1 + (n + 1) 9 + 81$  के गुणज [ $\therefore 81 = 9^2$ ]  
 $10^{n+1} = 10 + 9n + 81m$   
 $10^{n+1} - 9n = 81m + 10$   
 $\therefore$  शेष जब 81 से  $10^{n+1} - 9n$ , विभाजित होता है  $= 10$

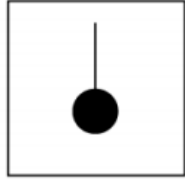
Ans.52(C)

आंकड़ों को आरोही क्रम में व्यवस्थित करने पर  
 3, 5, 7, 7, 11, 15, 21, 21, 23, 23, 55, 55, 55, 65, 67, 67, 85  
 कुल मिलाकर 17 पद हैं

Ans.53(B)

∴ आठवां पद माधिका = 21 है  
 बहुलक = अधिकतम घटन के साथ संख्या = 55  
 अंतर = 55 - 21 = 34  
 माना  $n = A$  और  $m$  स्ताम्भो की संख्या  
 =  $B$  की पंक्तियों की संख्या  
 $A$  के आयाम =  $1 \times n$   
 $B$  के आयाम =  $m \times 1$   
 गुणन के लिए,  $n = m$   
 $1 \times 1$  के  
 गुणनफल  $C$  का आयाम है  $1 \times 1$   
 $C$  के तत्वों की संख्या = 1

Ans.55(C) यदि  $a_{ij} = |i - j|$



$$|A| = 0(0-1) - 1(0-2) + 2(1-0) \\ \Rightarrow 4$$

Ans.56(C) किसी व्युत्क्रमणीय आव्यूह के संलग्न निश्चित गुणक = 1

Ans.57(B)  $A(1, 2, 0)$ ,  $B(2, 3, 0)$  और  $C(4, 4, 0)$   
 सभी बिंदु  $xy$  समतल पर हैं।  $Z$  घटक शून्य है  
 ∴  $xy$  समतल का समीकरण:  $z = 0$

Ans.58(A) सही उत्तर विकल्प 1 यानी 58500 है  
 पहले दो अंकों के लिए, 26 अक्षर हैं  
 26 में से दो को चुनना और व्यवस्थित करना  
 $= {}^{26}P_2 = 26!/24! = 650$   
 10 संख्याओं में से दो संख्या चुनना =  ${}^{10}P_2 = 10!/8! = 90$   
 तरीकों की संख्या =  $650 \times 90 = 58500$

Ans.59(C) दिये गए फलन में,  $x - 2 \geq 0$  है क्योंकि  $\sqrt{x}$  का केवल धनात्मक संख्या का डोमेन है

∴  $x \geq 2$   
 हर का शून्य मान नहीं होना चाहिए, उनका मान निकालने पर जिसमें हर शून्य होता है  
 $x^2 - 16x + 63 = 0$   
 $x^2 - 7x - 9x + 63 = 0$   
 $x(x - 7) - 9(x - 7) = 0$   
 $(x - 9)(x - 7) = 0$   
 यह  $x = 9$  और  $7$  के लिए शून्य है

Ans.60(C) ∴ डोमेन =  $[2, \infty) - \{7, 9\}$   
 प्रत्येक पद निम्न रूप का है  
 $T \equiv \sin\{x \pi/4\} \sin\{(x+1)\pi/4\} + \cos\{x \pi/4\} \cos\{(x+1)\pi/4\}$   
 जहाँ  $x$ , 1 से 8 तक भिन्न होता है  
 $\sin A \sin B + \cos A \cos B = \cos(B - A)$   
 $T \equiv \cos[(x+1)\pi/4 - x\pi/4] = \cos \pi/4 = 1/\sqrt{2}$   
 ऐसे 8 पदों का योग =  $8/\sqrt{2} = 4\sqrt{2}$

$4\sqrt{2} = \sqrt{n}$   
 दोनों ओर वर्ग करने पर  
 $n = 32$

Ans.61(D) एक इकाई सदिश का परिमाण = 1  
 ∴  $\sin^2 A + \sin^2 B = 1$   
 $\sin^2 A = \cos^2 B$  [∵  $1 - \sin^2 x = \cos^2 x$ ]  
 $\sin A = \pm \cos B$   
 $\sin A = \sin(\pi/2 \pm B)$   
 $A = \pi/2 \pm B$   
 $A \pm B = \pi/2$

Ans.62(A) ∴ (A) और (B) दोनों सही हैं  
 $0 \leq P(E) \leq 1$   
 $0 \leq [P(E)]^2 \leq 1$   
 $0 \leq x^2 + 1/4 \leq 1$   
 $0 \leq x^2 \leq 3/4$  [∵  $x^2$  गैर-ऋणात्मक है]  
 ∴  $x \in [-\sqrt{3}/2, \sqrt{3}/2]$  से सम्बंधित है

Ans.63(C)  $\sin A + \sin B = 2 \sin \frac{A+B}{2} \cdot \cos \frac{A-B}{2}$   
 $\sin 2x + \sin 6x = 2 \sin 4x \cos 2x$   
 $\sin 2x + 2 \sin 4x + \sin 6x = 2 \sin 4x \cos 2x + 2 \sin 4x$   
 $2 \sin 4x (\cos 2x + 1)$

$$1 + \cos 2x = 2 \cos^2 x \\ \sin 4x = 2 \sin 2x \cos 2x = 4 \sin x \cos x \cos 2x \\ \therefore 2 \sin 4x (\cos 2x + 1) \\ = 8 \sin x \cos x \cos 2x (\cos 2x + 1) \\ = 16 \sin x \cos^3 x \cos 2x \\ k = 16$$

Ans.64(C)

$$\frac{dy}{dx} - y = e^x \\ e^{-x} \frac{dy}{dx} - e^{-x} y = 1 \\ \frac{d(e^{-x}y)}{dx} = 1 \\ \int d(e^{-x}y) = \int dx \\ e^{-x}y = x + C \\ Y = x e^x + C e^x$$

Ans.65(C)

डेमोर्गन नियम के अनुसार  
 $E' \cap F' = (E \cup F)'$

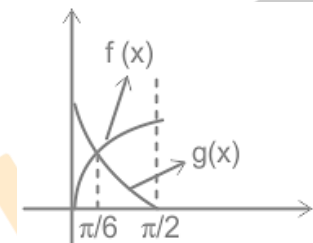
Ans.66(B)

$r = a_0 n^2$ , जहाँ  $a_0$  = प्रथम कक्षा की त्रिज्या  
 ∴  $k = 2$

Ans.67(C)

एक आंतरिक अर्धचालक में, छिद्रों की संख्या का घनत्व = इलेक्ट्रॉनों की संख्या का घनत्व  
 ∴ इलेक्ट्रॉनों के घनत्व की संख्या =  $5 \times 10^{34}/m^3$

Ans.68(C)



$f(x)$  और  $g(x)$  निम्न पर मिलते हैं

$$\sin x = 1 - \sin x \\ \Rightarrow 2 \sin x = 1 \\ \Rightarrow \sin x = 1/2 \\ \Rightarrow x = \pi/6 \\ \text{Area} = \int \{f(x) - g(x)\} dx \\ = \int_{\pi/6}^{\pi/2} (2 \sin x - 1) dx \\ = -2 \cos x - x \Big|_{\pi/6}^{\pi/2} \\ = -\pi/2 - [-\sqrt{3} - \pi/6] \\ = \sqrt{3} - \pi/3 \text{ sq. units}$$

Ans.69(B)

$$\int e^x (\tan^2 x + 2 \tan^3 x + 2 \tan x) dx \\ = \int e^x \{ \tan^2 x + 2 \tan x (\tan^2 x + 1) \} dx \\ = \int e^x \{ \tan^2 x + 2 \tan x \sec^2 x \} dx \\ [\because 1 + \tan^2 x = \sec^2 x] \\ = \int e^x \{ \tan^2 x + 2 \tan x \sec^2 x \} dx \\ \text{माना } \tan^2 x = f(x) \text{ है, तो } f'(x) = 2 \tan x \sec^2 x \\ = \int e^x \{ f(x) + f'(x) \} \\ = e^x f(x) + c \\ = e^x \tan^2 x + c$$

Ans.70(C)

$$\frac{dy}{dx} = 2 \cos^2 x \cos^2 y + 4 \cos^2 y \\ \frac{dy}{dx} = (2 \cos^2 x + 4) \cos^2 y \\ \frac{dy}{\cos^2 y} = (2 \cos^2 x + 5) dx \\ \sec^2 y dy = (\cos 2x + 5) dx \quad [\cos 2x = 2 \cos^2 x - 1] \\ \text{समाकलन करने पर} \\ \tan y = \sin 2x/2 + 5x + c$$