75/2015 (Pages : 4)

Maximum : 200 marks

Time : 1½ hours

PART I

(Each Answer Shall Be Limited To One Sentence)

A. Write the full form of the following :

1. MASER
2. EDAX
3. RADAR
4. MESFET
5. GSLV

B. Fill in the blanks :

6. ———— is used to detect the presence of an electric charge.
7. The absorption of ink by blotting paper involves ————.
8. Smooth cylinder lying on its convex surface remains in ———— equilibrium.
9. The spontaneous decay of nuclei is called ————.
10. When hydrogen atom is in its first excited level, its radius is ———— its ground state radius.
11. The ability of a material to remain magnetized after removal of the magnetizing force is known as ————.
12. The phase difference between the input and output ac voltage signals of a common-emitter amplifier is ————.
13. The tidal waves in the sea are primarily due to ————.
14. The velocity of a particle performing simple harmonic motion, when it passes through its mean position is ————.
15. The range of a projectile is maximum, when the angle of projection is ————.

[P.T.O.]

C. Choose the correct answer :

16. An ideal heat engine operates between two temperature 600 K and 900 K. What is the efficiency of the engine?

(a) 50% (b) 10%
(c) 33% (d) 100%

17. Moment of inertia of a triangular section of base (b) and height (h) about an axis passing through its C.G. and parallel to the base, is

(a) $bh^3/4$ (b) $bh^3/8$
(c) $bh^3/12$ (d) $bh^3/36$

18. The photoelectric effect was explained by Albert Einstein by assuming that:

(a) Light is a wave (b) Light is a particle
(c) An electron behaves as a wave (d) An electron behaves as a particle

19. Which of the following formulas can be used to determine the de Broglie wavelength?

(a) $\lambda = hmv$ (b) $\lambda = h/mv$
(c) $\lambda = hm/c$ (d) $\lambda = mv/h$

20. The Lyman series of hydrogen spectrum lies in the region

(a) Infrared (b) Ultraviolet
(c) Visible (d) Of X rays

21. Two plane mirrors are at 45° to each other. If an object is placed between them, then the number of images will be

(a) 5 (b) 7
(c) 9 (d) 8

22. A body moves a distance of 10 m along a straight line under the action of a force of 5 N. If the work done is 25 joules, the angle which the force makes with the direction of motion of the body is

(a) 3° (b) 60°
(c) 30° (d) 90°

23. When a spring is stretched by 2 cm, it stores 100 J of energy. If it is stretched further by 2 cm, the stored energy will be increased by

(a) 100J (b) 300J
(c) 200J (d) 400J

24. Select the pair whose dimensions are same

(a) Pressure and stress
(b) Pressure and force
(c) Strain and stress
(d) Power and force

25. A tuning fork makes 256 vibrations per second in air. When the velocity of sound is 330m/s, then wavelength of the tone emitted is

(a) 0.56m
(b) 1.11m
(c) 0.89m
(d) 1.29m

26. It is possible to distinguish between the transverse and longitudinal waves by studying the property of

(a) Interference
(b) Reflection
(c) Diffraction
(d) Polarization

27. Natural radioactivity was discovered by

(a) Marie Curie
(d) Ernest Rutherford
(c) Henri Becquerel
(d) Enrico Fermi

28. Solar eclipse will take place when

(a) The sun is between the moon and the earth
(b) The earth is between the moon and the sun
(c) The moon is between the sun and the earth
(d) The moon does not lie on the line joining the sun and the earth

29. On a stationary sail boat, air is blown from a fan attached to the boat. The boat

(a) Moves in opposite direction in which the air is blown
(b) Does not move
(c) Moves in the same direction in which air blows
(d) Spins around

30. Supersonic plane fly with the speed

(a) Less than the speed of sound
(b) Of sound
(c) Greater than the speed of sound
(d) Of light

(30 × 4 = 120)

PART II

Answer ALL questions. Answer shall be limited to one paragraph.

Questions 31 to 38 carry 10 marks each.

31. Distinguish between Fraunhofer and Fresnel's diffraction

32. Explain Nuclear Fusion.

33. Explain Raman Effect.

34. Show that a particle of rest mass m_0, total energy E and linear momentum P satisfies the relation $E^2 = c^2 P^2 + m_0^2 c^4$, where c is the velocity of light in free space.

35. Two identical thin rings, each of radius, R meter are co — axially placed at distance R meter apart. If Q_1 and Q_2 coulombs are respectively the charges uniformly spread on two rings. What is the work done in moving a charge q from the centre of one ring to that of the other.

36. Draw the logic circuit for the following Boolean expression.

$Y = \overline{(A + \overline{B})\ (\overline{B + C})}$. What are the "Y" values for the input combinations?

(a) 1, 1, 0 (b) 1, 0, 1 (c) 0, 0, 1.

37. In the x-ray diffraction of a set of crystal planes having d equal to 0.18nm, a first order reflection is found to be an angle of 22°. Find the wave length of x-ray. (Given Sin22° =0.208).

38. A wave function is given by

$$\psi(x) = A(2/L)^{1/2}[\sin(\pi x/L) + 2\sin(2\pi x/L)]$$

Find the value of A that will normalize the wave function in the space defined by $0 \le x \le L$.

$(8 \times 10 = 80)$