

SECTION-A [40 MARKS]

ATTEMPT ALL QUESTIONS

**QUESTION NUMBER ONE IS MULTIPLE CHOICE TYPE WHICH CARRY
ONE MARK EACH [1X15=15 MARKS]**

- Q1. (i) Moment of force or torque and work done both have same unit, newton-meter, but these differ in:
- (A) Work is vector and torque is scalar
 - (B) Work is scalar and torque is vector
 - (C) Work is also termed in joule but torque is only newton-meter
 - (D) Both (B) and (C) are correct
- (ii) Device that works on principle of moment is:
- (A) Spring balance
 - (B) Beam balance
 - (C) Both spring balance and beam balance
 - (D) None of the above
- (iii) Energy of subatomic particles is measured in:
- (A) Electron volt
 - (B) Electron joule
 - (C) Electron watt
 - (D) All of these
- (iv) Device that converts heat energy to electrical energy is:
- (A) loudspeaker
 - (B) thermocouple
 - (C) geyser
 - (D) battery
- (v) Efficiency of a machine is:
- (A) ratio of work output to work input
 - (B) ratio of work input to work output
 - (C) ratio of work output to power input
 - (D) ratio of work input to power output
- (vi) If displacement of load is equal to displacement of effort, machine acts as:
- (A) speed multiplier
 - (B) force multiplier
 - (C) to change the direction of effort
 - (D) an ideal machine
- (vii) Cause of refraction of light when it passes from one medium to another is:
- (A) Change in the refractive index of medium
 - (B) Change in wavelength
 - (C) Bending of light ray in a medium
 - (D) Change in speed of light
- (viii) A wire stretched between two fixed supports, is plucked exactly in the middle and then released. It executes (neglect the resistance of the medium):
- (A) Resonant vibrations
 - (B) Damped vibrations
 - (C) Natural vibrations
 - (D) Forced vibrations

- (ix) For an ideal machine the MA and VR are related as:
 (A) $MA < VR$
 (B) $MA > VR$
 (C) $MA = VR$
 (D) $MA \leq VR$
- (x) Image formed at focus of a convex lens is:
 (A) real and erect
 (B) virtual and erect
 (C) real and inverted
 (D) virtual and diminished
- (xi) A boy can hear an echo of his own voice from a distant hill after one second, if speed of sound in air is 350 ms^{-1} , boy is standing at a distance of:
 (A) 125 m from hill
 (B) 175 m from hill
 (C) 135 m from hill
 (D) 145 m from hill
- (xii) Limitations of Ohm's law is that:
 (A) Temperature and physical conditions of conductor must remain constant
 (B) Material nature of conductor must remain constant
 (C) Voltage applied must remain constant
 (D) Current passing in the conductor must remain constant
- (xiii) In a cell when current flows, correct relationship is given by:
 (A) $\text{emf} = \text{terminal voltage} + \text{voltage drop}$
 (B) $\text{emf} = \text{terminal voltage} - \text{voltage drop}$
 (C) $\text{emf} = \text{terminal voltage} / \text{voltage drop}$
 (D) $\text{emf} = \text{terminal voltage} \times \text{voltage drop}$
- (xiv) If salt is added to ice, then its melting point:
 (A) Increases from 0°C to 22°C
 (B) Decreases from 0°C to -22°C
 (C) First increases to 22°C then decreases to -22°C
 (D) Remains constant
- (xv) Seven neutrons are present in isotope of Carbon, this isotope is:
 (A) ${}^{13}_4\text{C}$
 (B) ${}^{12}_6\text{C}$
 (C) ${}^{14}_7\text{C}$
 (D) ${}^{13}_6\text{C}$
- Q2. (a) Define moment of force and state two factors on which it depends. [3]
 (b) What is the position of the center of gravity of a (i) rhombus (ii) cylinder [2]
 (c) Calculate the power of an engine required to lift 10^5 kg of coal per hour from a mine 360 m deep. (Take $g = 10 \text{ ms}^{-2}$) [2]
 (d) State two differences between Kinetic energy and Potential energy. [2]
 (e) When does a machine work as (i) force multiplier (ii) speed multiplier. [2]
 (f) Make a diagram to show a single movable pulley in combination with a single fixed pulley. [2]
 (g) State the principle of reversibility. How is the refractive index of the first medium related to the second? [2]
- Q3. (a) Make a ray diagram to show the image formation in a concave lens when the image is at finite distance. [2]
 (b) Name one factor on which the frequency of sound emitted due to vibrations in air column depend. How does it depend upon the factor stated by you? [2]
 (c) If a wire is doubled on itself, how will its resistance change? [2]
 (d) Name the material used for making the wire used in a heater. State its characteristics properties. [2]

- (e) Draw a diagram to show the deflection of alpha, beta and gamma radiations when subjected to an electric field. [2]

SECTION- B [40 MARKS]

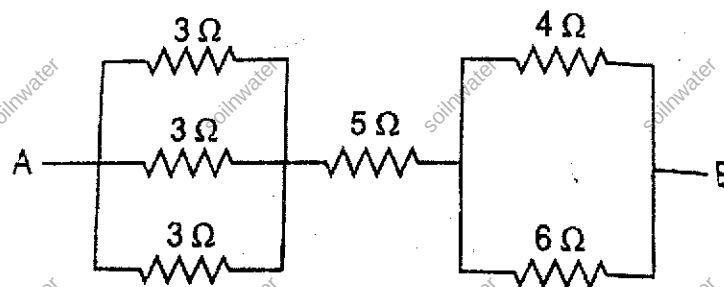
ATTEMPT ANY FOUR QUESTIONS FROM THIS SECTION

- Q4. (a) What is meant by gravitational potential energy? Derive an expression for a body of mass ' m ' placed at a height ' h ' above the ground. [3]
- (b) Make a properly labeled diagram of block and tackle system of velocity ratio equal to four. Also write its efficiency in an ideal case. [3]
- (c) A force of 15 N is required to pull up a body of mass 2 kg through a distance of 5 meter along an inclined plane making an angle of 30° with the horizontal. Calculate:
- The work done by the force in pulling the body.
 - The work done against the force due to gravity. (Take $g = 9.8 \text{ ms}^{-2}$)
 - The force due to gravity on the body.
 - Account for the difference in answers in part (i) and (ii)
- [4]

- Q5. (a) During the formation of critical angle:
- What should be the passage of light ray?
 - What should be the angle of refraction?
 - Establish the relationship of critical angle with refractive index for glass air interface. [3]
- (b) Where should an object be placed in front of a convex lens of focal length 0.12 meter to obtain a real image of size three times the size of the object, on the screen? [3]
- (c) (i) If a monochromatic beam of light undergoes minimum deviation through an equiangular prism, how does the beam pass through the prism, with respect to its base?
- (ii) If white light is used in the same way as in part (i) above, what change is expected in the emergent beam?
- (iii) What conclusion do you draw about the nature of white light in part in part (ii)?
- (iv) Illustrate your conclusion in part (ii) with a diagram. [4]

- Q6. (a) Name the three factors on which the frequency of vibration in a stretched string depends. Also write the formula for it. [3]
- (b) What is the audible range of frequency of a sound wave for a normal human ear? Assuming that the speed of sound in air is 330 ms^{-1} for all frequencies, calculate the wavelengths corresponding to the extreme range of frequencies mentioned by you. [3]
- (c) (i) What is an echo?
- (ii) A man standing in front of a wall produces a sound and hears an echo after 3 s. He walks ' x ' m away from the wall and produces the same sound. Now he hears an echo after 5.25 s. Calculate the distance he walked away from the wall. (Speed of sound in air is 340 ms^{-1}) [4]

- Q7. (a) What is a non- linear resistance? Give two examples of such resistance. Draw an illustrative V-I curve showing non-linear resistance. [3]
- (b) Find the equivalent resistance between point A and B.



- (c) Two coils of resistances $R_1 = 3\ \Omega$ and $R_2 = 6\ \Omega$ are connected in series across a battery of p.d. 12 V. Draw a circuit diagram. Find: (i) the electrical energy consumed in 1 minute in each resistance, and (ii) the total electrical energy supplied by the battery in 1 minute. [4]

- Q8. (a) What is a fuse? State the characteristics of a fuse wire. Can the fuse be connected in the neutral wire? If not, why? [3]
(b) State the similarities between a current carrying solenoid and a bar magnet. [3]
(c) (i) An element ${}^A_ZS$ decays to ${}^{222}_{85}R$ after emitting 2 α particles and 1 β particles. Find the atomic number and atomic mass of the element S
(ii) What are background radiations? Name the source of internal radiations. [4]
- Q9. (a) State three differences between heat capacity and specific heat capacity. [3]
(b) A mass of 50 g of a certain metal is immersed in 100 g of water at 11°C . The final temperature is 20°C . Calculate the specific heat capacity of the metal. Assume that the specific heat capacity of water is $4.2\text{ Jg}^{-1}\text{K}^{-1}$. [3]
(c) (i) What is latent heat of vaporization or boiling?
(ii) What will be the result of mixing 400 g of copper chips at 500°C with 500 g of crushed ice at 0°C ? Specific heat capacity of copper = $0.42\text{ Jg}^{-1}\text{K}^{-1}$ and specific heat of fusion of ice = 340 Jg^{-1} . [4]
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