Answer Key SET – A

TED (15) - 1003

ENGINEERING PHYSICS – 1

(Maximum marks: 100)

No.		PART- A		
I	1	1 mark for the SI unit of each term	2	2
	2	Explanation of collinear vectors	2	2
	3	Statement of triangle law or figure	2	2
	4	Statement of Hook's law	2	2
	5	Explanation for two applications (1x 2 = 2)	2	2
		PART - B		
II	1	Statement of the law In collision of two bodies of masses m1 and m2 in a straight line Force on m_2 by $m_1 = m_2(v_2-u_2)/t$ Force on m_1 by $m_2 = m_1(v_1-u_1)/t$ By third law, Action = - Reaction $m_2(v_2-u_2)/t = -m_1(v_1-u_1)/t$ $m_1u_1+m_2u_2 = m_1v_1+m_2v_2$	1 1 1 1 1 1	6
	2	X component = r cosθ Y component = r sinθ $r^2 = x^2 + y^2$ The other component = $\sqrt{(40^2 - 20^2)} = 34.64$ N	1 1 1 3	6
	3	a = F/m = 20/5 = 4 m/s v = u + at = 0 + 4x 10 v = 40 m/s K.E. = ½ mv^2 K.E. = ½ x 5 x 40^2 K.E. = 4000J	1 1 1 1 1 1	6
	4	$Y = Fl/(A\Delta l)$ $F_1l_1 / \Delta l_1 = F_2l_2 / \Delta l_2$ $\Delta l_1 / \Delta l_2 = (F_1/ F_2) \times (l_1 / l_2)$ $\Delta l_1 / \Delta l_2 = (2/1)x(1/3) = 2/3$ $\Delta l_1 : \Delta l_2 = 2:3$	1 2 1 1 1	6
	5	Statement of Bernoulli's theorem or equation Figure for air foil Explanation of working of air foil	2 1 3	6
	6	First mode of vibration , figure and equations Second mode of vibration, figure and equations Third mode of vibration, figure and equations	2 2 2	6
	7	Figure Explanation $Y = a\sin\omega t$ $dy/dt = a\omega\cos\omega t$ $d^2y/dt^2 = -a\omega^2\sin\omega t$ $d^2y/dt^2 = -\omega^2y$	1 2 1 1 1	6
		PART - C		
		UNIT - I		
III	a	½ mark for dimension of each term At the top v = 0 $a = 9.8$ m/s^2	1 1 1	3
	b	$S = ut + \frac{1}{2} at^2$ S – displacement, u- initial velocity, a-acceleration, t- time	2	6

		Displacement in n seconds = $un+ ½ an^2$ Displacement in (n-1) seconds = $u(n-1)+ ½ an^2$ $S_n=(un+ ½ an^2)- (u(n-1)+ ½ a(n-1)^2)$ $S_n= u+(n- ½)a$	1 1 1 1	
	c	$H = ut – ½ gt^2$ $H = 98 \times 22 – ½ \times 9.8 \times 22^2$ H = -215.6 m Height of the cliff = 215.6 m	2 2 2	6
		OR		
IV	a	Impulse = F x t Impulse = (mv – mu)/t x t Impulse = mv- mu = change in momentum	1 1 1	3
	b	Statement of law Fα dP/dt F = d(mv)/dt F = m dv/dt F = ma OR similar derivation	2 1 1 1 1	6
	c	Power = Work / time P = 20 x mgh/t P = 20x 40x9.8x0.7/60 P = 91.47 W	1 2 2 1	6
		UNIT - II		
V	a	Explanation of moment of the force Unit = Nm	2 1	3
	b	Figure Equation for moment of the couple Derivation of W = CΘ	1 1 4	6
	c	P = 2πNC and explanation of terms P = 2x 3.14x7x100 Calculation and P = 4396W	2 2 2	6
		OR		
VI	a	Description of law	3	3
	b	Definition of coplanar forces Figure Explanation of the condition of translational equilibrium Explanation of the condition of rotational equilibrium	1 1 2 2	6
	c	Correct figure If the scale OA is suspended at C, for rotational equilibrium, 6.5 x OC = 1 x 0.3 + 2 x 0.45 + 0.5 x 0.5 + 3 x 0.86 Calculation and OC = 0.62 m The scale should be suspended at 62 cm mark.	2 2 2	6
		UNIT - III		
VII	a	1 mark for each energy (1x 3)	3	3
	b	Explanation of viscosity Viscous force depends on, (i)Velocity gradient (ii)Area of liquid layers For liquids $\eta_t= \eta_0 /(1 + at + bt^2)$ and description of terms viscosity increases with temperature	1 1 1 2 1	6
	c	$F = 6\pi r\eta v$ and description of terms $F = 6 \times 3.14 \times 0.1\times10^{-3} \times 1.8\times10^{-5} \times 0.15\times10^{-2}$ $F = 5.1\times10^{-11}N$	2 2 2	6
		OR		

VIII	a	Definition of stress Unit of stress = N/m^2 Definition of strain Strain has no unit	1 ½ 1 ½	6
	b	Definition of terminal velocity Viscous force $F = 6\pi r\eta v$ Downward force = $mg = 4/3\ \pi r^3 \rho g$ Upward force = up thrust + viscous force $= 4/3\ \pi r^3 dg + 6\pi r\eta v$ $4/3\ \pi r^3 \rho g = 4/3\ \pi r^3 dg + 6\pi r\eta v$ $v = 2r^2(\rho - d)g/9\eta$ or similar derivation	1 1 1 1 1 1	6
	c	$V = \pi Pr^4/(8l\eta)$ and description of terms $10 \times 10^{-3} = 3.14 \times P \times (5\times10^{-2})^4/(8\times1000\times0.001)$ Calculation and $P = 4076.4\ N/m^2$	2 2 2	6
		UNIT - IV		
IX	a	Definition of simple harmonic motion 1 mark for each example (1x2=2)	1 2	3
	b	Figure Description or procedure $l_1 + e = \lambda/4$ $l_2 + e = \lambda/4$ $l_2 - l_1 = \lambda/2$ $\lambda = 2(l_2 - l_1)$ $v = 2f(l_2 - l_1)$	½ 1 ½ 1 1 1 1	6
	c	$vt / v_0 = \sqrt{[(273+t)/273]}$ $v_t/300 = \sqrt{(274/273)}$ $v_t = 330.6$ m/s Change in velocity 330.6 – 330 = 0.6 m/s	1 2 2 1	6
		OR		
X	a	Description of magnetostriction method or piezoelectric method	3	6
	b	Explanation of free vibration and forced vibration (2 x 1 ½) Explanation of resonance Condition for resonance	3 2 1	3
	c	For closed pipe $v = f/4l$ $v = f \times 4l$ $v = 384 \times 4 \times 22.1\times10^{-2}$ $v = 339.5$ m/s	2 2 2	6