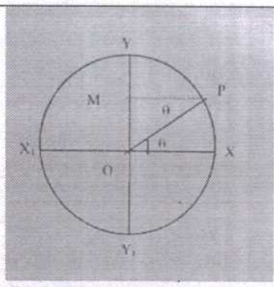
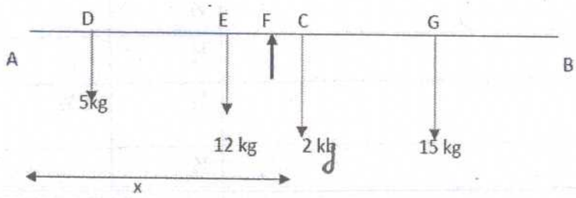
SCHEME OF EVALUATION

(Scoring Indicators)

	Revision – 2015 Couse code – 1003 Course Title – Engineering Physics I			
Qst No	Scoring Indicator	Split up score	Sub total	Total
	Part A			
I.1	Definition of momentum	1 ½	2	
	Unit	½		
I.2	Statement	2	2	
	(Figure only)	1		
I.3	B = - dP /(dV/V)			10
	dP = 10^5 Pa, dV/V = - 2% = - 2/100			
	B = 10^5/0.02 = 5 x 10^6 Pa		2	
	Formula	½		
	Proper substitution of values	1		
	Result	½		
I.4	$v \propto \sqrt{T}$	2	2	
I.5	Definition of ultrasonic sounds	1		
	Definition of infra sonic sound	1	2	
	PART B			
II.1	m1 = 5 kg, m2 = 8 kg, u1 = 5 m/s, u2 = - 3 m/s	1		
	m1u1 + m2u2 = (m1+m2)v	2	6	
	substitution	1		
	Result in SI System	2		
II. 2	Definition of concurrent forces	2		
	Statement of Lami's theorem	2	6	
	Diagram	1		
	Equation	1		

II.3	Definition of like parallel and unlike parallel forces	4		
	Translational equilibrium – total force = 0	1	6	
	Rotational equilibrium, total moment of force = 0	1		
II.4	Definition – 1+ 1+ 1	3		
	Mathematical equations 1 + 1 + 1	3	6	
II.5	$d_1 = 0.03m$, $r_1 = 0.015m$, $d_2 = 0.05m$, $r_2 = 0.025m$, $v_1 = 0.2m/s$, R =?, v_2 = ?	1		
	$R = a_1v_1$	1		
	$= \pi r_1^2 v_1 = 1.413 \times 10^{-4}\ m^3/s$	1 ½	6	
	$v_2 = a_1 v_1/a_2$ OR $v_2 = R/a_2$	1		
	$= 1.413 \times 10^{-4}/3.14 \times (0.025)^2 = 0.072\ m/s$	1 ½		
II.6	 Figure	1		42
	OP = A, amplitude, ON = x , OM = y			
	$x = A\cos\theta = A\cos\omega t$ and $y = A\sin\omega t$	1		
	$v_x = dx/dt = -A\omega \sin wt$ and $a_x = dv/dt = -\omega^2 A\cos\omega t = -\omega^2 x$	1 ½	6	
	$vy = dy/dt = A\omega\cos \omega t$ and $ay = dv/dt = -\omega 2 A\sin wt = -\omega^2 y$	1 ½		
	So, acceleration, $ax \propto -x$ and $ay \propto -y$ So, it represents SHM	1		
II. 7	$V_t = 2V_0$	1		
	$vt = v_0\sqrt{\frac{t+273}{273}}$	1	6	
	$2v_0 = v_0\sqrt{\frac{t+273}{273}}$	1		
	Calculation and final result t = 819 ^0C	3		
	PART C			
III.a	½ markeach for all quantities - 3 x ½	1 ½	3	
	½ mark each for units - 3 x ½	1 ½		
III. b	$D_6 = 16m$ and $D_{10} = 24m$, D_{12} = ?			
	$D_n = u + a (n - ½)$	1		

	$D_6 = 17 = u + a(6 - ½)$	½		
	$D_{10} = 24 = u + a(10 - ½)$	½	6	
	Solving, u = 5m/s	1		15
	$a = 2\ m/s^2$	1		
	$D_{12} = u + a(12 - ½) = 28m$	2		
III. c	$v = u + at$	½		
	$S = ut + \frac{1}{2}at^2$	½	3	
	$v^2 = u^2 + 2aS$	½		
	v = final velocity, u = initial velocity, t = time, S = displacement and a = acceleration	1 ½		
	(i) $v = u - gt$	½		
	$S = ut - \frac{1}{2}gt^2$	½	1 ½	
	$v^2 = u^2 - 2gS$	½		
	(ii) $v = u + gt$	½		
	$S = ut + \frac{1}{2}gt^2$	½	1 ½	
	$v^2 = u^2 + 2gS$	½		
IV.a	1 mark each for each law 3x 1	3		
	Derivation of the formula f = ma	3	6	
IV. b	Statement of the law	2		
	Derivation	4	6	15
IV. c	F = 40N, m= 20 kg, u = 0, t =4s, v =? S=?			
	$A = F/m = 2\ m/s^2$	1		
	v = u + at = 8 m/s	1	3	
	$S = ut + ½\ at^2 = 16m$	1		
V. a	Definition of resultant	1		
	Definition of equilibrant	1	3	
	They are equal and opposite	1		
V. b	Figure	2		
	Derivation of the equation $R = \sqrt{P^2 + Q^2 + 2PQcos\theta}$	2	6	15
	Derivation of the equation $tan\alpha = \frac{Qsin\theta}{P+Qcos\theta}$	2		

V. c	R = P = Q	1		
	$R^2 = P^2 + Q^2 + 2PQcos\theta$	2	6	
	Substitution	1		
	Simplification and result $\theta = 120^0$	2		
VI. a	Definition of couple	2	3	
	Significance – produces pure rotation	1		
VI. b	Figure	1		15
	Derivation of the expression for work W = 2πC	3	6	
	Power = work/time = work x frequency (for one rotation)	1		
	P = 2πNC	1		
VI. c	Neat figure showing the position of masses	2	6	
				
	Let the pivot be placed at F, at a distance from x. C is the centre of gravity For rotational equilibrium, total moment of the force = 0	1		
	Taking the moments about F, -5(x – 20) – 12(x – 35) + 2(50 – x) + 15 (75 – x) = 0	2		
	Solving, x = 52.2 cm	1		
VII. a	$KE = \frac{1}{2}mv^2$	½		
	$PE = mgh$	½	3	
	$Pressure\ Energy = PV$	½		
	Explanation of the terms	1 ½		
VII. b	Statement	1		
	Figure	1	6	15
	Proof	4		
VII. c	$N_1 = 27$, $N_2 = 1$, $v_1 = 3$ m/s, $v_2 = ?$			
	Terminal velocity, $v = \frac{2}{9}\frac{r^2(\rho - \sigma)g}{\eta}$	1		
	Or $v \propto r^2$			
	$\frac{v2}{v1} = \left(\frac{r2}{r1}\right)^2$	1		

	Radius of the bigger drop $r2 = n^{\frac{1}{3}} r1 = 3r1$	2		
	So, $\frac{v2}{v1} = \left(\frac{3r1}{r1}\right)^2 = 9$	1		
	$v2 = 9v1 = 27\ m/s$	1		
VIII. a	Figure	1		
	Equation	1		
	Brief explanation	1		
VIII. b	Definition	1		15
	For attaining terminal velocity, total upward force = total downward force	1	6	
	Weight = Up thrust + Viscous force	1		
	Substitution	1		
	Simplification and final result, $v = \frac{2}{9}\frac{r^2(\rho - \sigma)g}{\eta}$	2		
	• Final result only, give 1 mark			
VIII. c	d1 = 0.5 m, d2 = 0.2 m, h1= 9m, h2 = 3m, v1 = 1.5 m/s P1 = 5.4 x 10^5 Pa v2 = ? , P2 =?			
	Equation of continuity, a1v1 = a2v2	1		
	Substitution	1		
	Result v2 = 9.375 m/s	1	6	
	Bernoulli's equation	1		
	Substitution	1		
	Result P_2 = 5.56 x 10^5 Pa	1		
IX. a	Definitions 3 x 1	3		
IX. b	Figures (First resonating and second resonating lengths) and brief description ½ + ½ + 1	2		
	$L1 + e = \frac{\lambda}{4}$	½		
	$L2 + e = 3\frac{\lambda}{4}$	½		15
	Solving for $\lambda = 2\ (L2 - L1)$	1		
	$v = \nu\lambda$	1		
	$v = 2\nu(L2 - L1)$	1		
IX. c	$\nu = 500Hz,$			

	$\frac{v}{4L} = 500$			
	$L = \frac{v}{2000} = \frac{350}{2000} = 0.175\ m$	2		
	When the pipe is cut into two equal parts, we get an open pipe and a closed pipe of equal length.			
	For the open pipe $v = \frac{v}{2L'} = \frac{350}{2\ x 0.0875} = 2000\ Hz$ (1+1)	2		
	For the closed pipe $v = \frac{v}{4L'} = \frac{350}{4\ x\ 0.0875} = 1000\ Hz$ (1+1)	2		
X. a	Definition of transverse wave	1		
	Example	½	3	
	Definition longitudinal wave	1		
	Example	½		
X. b	Figures of first, second and third mode (1+1+1)	3		
	Derivation of fundamental frequency $v = \frac{v}{2L}$	1	6	15
	Derivation of first overtone $v' = 2\frac{v}{2L} = \frac{v}{L}$	1		
	Derivation of second overtone $v'' = 3\frac{v}{2L}$	1		
X. c	A = 0.05m, when x = 0.03m, a = 0.48m/s^2			
	a = $\omega^2 x$	1		
	$\omega = \sqrt{\frac{a}{x}}$ = 4 rad/s	1		
	$T = \frac{\omega}{2\pi}$	1		
	= 0.64 s	1		
	$v = \frac{1}{T}$	½		
	= 1.56 Hz	½		
	V $_{max}$ = ωA	½		
	= 0.02 m/s	½		