Que. No.	Sub. Que.	Stepwise Solution	Marks	Total Marks
		Important Instructions to examiners: 1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme. 2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate. 3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills). 4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn. 5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer. 6) In case of some questions credit may be given by judgment on part of examiner of relevant answer based on candidate's understanding. 7) For programming language papers, credit may be given to any other program based on equivalent concept.		

Que. No.	Sub. Que.	Stepwise Solution	Marks	Total Marks
1)		**Attempt any NINE of the Following:**		18
	a)	**Define (i) Uniform linear velocity (ii)Angular velocity.**		
		Each Definition	1	2
		Uniform Linear velocity:- Uniform **l**inear velocity is the velocity of an object moving in a straight line when its direction does not changes. OR If a body covers equal displacement in equal interval of time then it is known as uniform linear velocity. **Angular velocity:-** The rate of change of angular displacement with respect to time is called as angular velocity.		
	b)	**State euation of angular motion.(Any two)**		
		Any two	2	2
		$\omega = \omega_0 + \alpha t$ $\theta = \omega_0 t + \frac{1}{2}\alpha t^2$ $\omega^2 = \omega_0{}^2 + 2\alpha\theta$		
	c)	**State Newton's Law of Motion(Any two)**		2
		Any two	2	
		(i)Newton's First Law of motion : It states that every body continues in its state of rest or of uniform motion in a straight line,unless it is acted upon by some external force. **(ii)Newton's Second Law of motion :** It states that the rate of change of momentum of a body is proportional to the applied force and takes place in the direction of force. **(ii)Newton's third Law of motion :** It states that for every action, there is always an equal and opposite reaction.		
	d)	**State law of conservation of momentum.**	2	2
		Statement : It states that the total momentum of system consisting of two or more colloiding bodies before impact remains unchanged after impact,provided no external force acts on it.		

WINTER – 2015 EXAMINATION

Subject Code: 17207 **Model Answer**

Que. No.	Sub. Que.	Stepwise Solution	Marks	Total Marks
1)	e)	**Define (i)Work (ii) Efficiency of pump.** **Each definition** **(i)Work :** It is defined as the product of force acting on the body and the displacement produced. **(ii)Efficiency of pump :**It is defined as the ratio of water output compared shaft power supplied by pump motor.	1	2
	f)	**Define (i) Projectile Motion (ii) Angle of projection.** **Each definition** **(i) Projectile Motion :** Projectile motion is the motion of a body thrown in air at an angle θ ($\theta < 90^0$)with the horizontal **OR** Projectile motion is the motion of a body thrown in air making some angle θ with the horizontal,moving freely under gravity. **(ii) Angle of projection :**It is the angle made by the velocity of projection with the horizontal at the original point.	1	2
	g)	**Define (i) Time of flight (ii) Frequency.** **Each Definition** **(i) Time of flight :** The total time in which the projectile covers the entire trajectory is called the time of flight. **(ii) Frequency :** The number of oscillations completed in one second is called as frequency**.** **OR** The reciprocal of period is called frequency.	1	2
	h)	**Define (i) Reverberation (ii) Luminous flux** **Each Definition** **(i) Reverberation:** It is the persistence of sound due to multiple reflections in a hall even after the source of sound is cut-off. **(ii) Luminous flux**: The amount of light which flows from a source per second is called as luminous flux.	1	2
	i)	**Define (i) Utilization factor (ii)Threshold frequency.** **Each Definition** **(i) Utilization factor :** It is defined as the ratio of luminous flux received by working area to luminous flux emitted by a source. **(ii)Threshold frequency:**The minimum frequency of incident light at which emission just begins.	1	2

Que. No.	Sub. Que.	Stepwise Solution	Marks	Total Marks
1)	j)	**State law of illumination.(Any two)** **Any two** (i)It states that the intensity of illumination is directly proportional to luminous intensity of source. (ii) It states that the illumination of a surface is inversely proportional to squre of the distance of the surface from the source.	2	2
	k)	**State factors affecting indoor lighting.** **Each factor** Factors affecting indoor lighting 1) Efficiency of the source 2) Utilization factor 3) Maintenance factor 4) Space to height ratio 5) Glare effect	1	2
	l)	**A car has initial velocity of 6 m/s. it accelerates for 12 sec at the rate of 3.5 m/s^2.determine the final velocity and distance travelled during this time.** **Each Formula** **Answer with unit** Given : u = 6 m/s t = 12 sec a = 3.5 m/s^2 v =? s =? $v = u + at$ $v = 6 + (3.5) \times (12)$ **v = 48 m/s** $s = ut + (1/2)at^2$ $s = (6 \times 12) + (1/2)(3.5)(12)^2$ **s = 324 m**	1/2 1	2

Que. No.	Sub. Que.	Stepwise Solution	Marks	Total Marks
2)		**Attempt any Four of the following:**		16
	a)	**State advantages of non-destructive testing over destructive testing.**		4
		Any four advantages	4	
		Advantages of non-destructive testing 1. Rapid inspection of each & every component is possible. 2. 100 % examination of material or production is possible. 3. NDT methods can be automated to lower their costs. 4. Testing is possible on shop, floor because of portable equipments; this controls the equality of further production. 5. Permanent record of testing can be made during the testing process. 6. The destructed parts can be separated in the early stages of manufacturing. This saves the time & production cost. 7. Higher accuracy, reliability & repeatability in the test result can be obtained. **Any other relevant advantage**		
	b)	**Give comparision between liquid penetrating testing and ultrasonic testing.**		4
		Any four point	4	

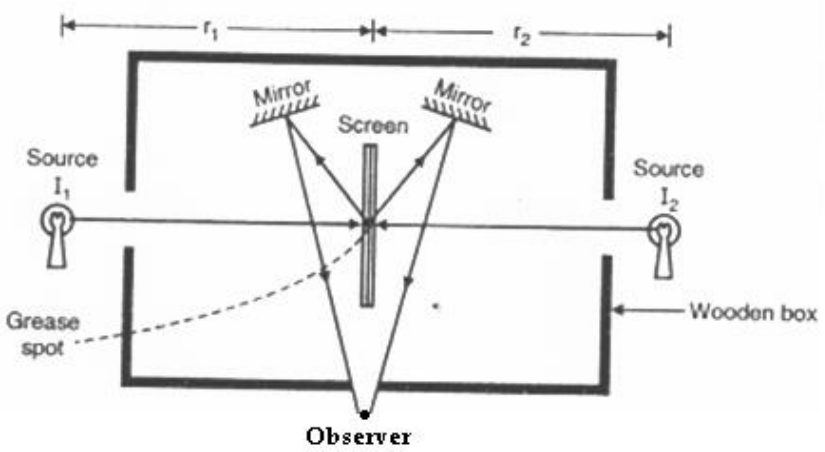
Liquid penetrating testing	**Ultrasonic testing**
(i) Probing medium is penetrant.	(i) Probing medium is ultrasonic.
(ii) It works on the principle of capillary action.	ii) It works on the principle of reflection of ultrasonic from disorder.
(iii) It easy and economical.	(iii) it requires expertise.
(iv) It is not recomonded for highly porous material.	(iv) It cannot be used without Couplant.

Que. No.	Sub. Que.	Stepwise Solution	Marks	Total Marks
2)	c)	**Two vehicles A and B are moving in same direction at a speed of 15 m/s.but car B is ahead of car A by 300 m. If vehicle A is accelerated by 3 m/s^2 and vehicle B has same speed as that of earlier,find at what distance vehicle A and B meet each other.**		4
		Formulla	2	
		Answer with unit	2	
		Initial speed of both vehicles = u = 15 m/s Vehicle B ahead of A by 300 m Let they meet at a distance x from B. A 300 m B x Consider vehicle B Speed = distance / time 15 = x / t t = x/15 ……..(i) Now consider vehicle A s = ut + (1/2) at^2 but s = (300 + x) (300 + x) =15 t + (1/2)(3)t^2 Put t = x/15 (300 + x) =15(x/15)+ (1/2)(3)(x/15)^2 x^2 = 67500/1.5 x^2 = 45000 **x = 212.13 m**		
	d)	**State factors affecting acoustical planning of an auditorium and explain any one of them.**		4
		Any three factor	3	
		Explanation	1	
		Factors affecting acoustical planning 1) Echo 2) Reverberation 3) Reverberation time 4) Creeping of sound 5) Echelon effect 6) Noise 7) Intensity and Loudness 8) Balconies **9) Or any other relevant factor**		

2)	d)	i) Echo: The echo is defined as the same sound heard again after an interval of $1/10^{th}$ second due to reflection of the original sound from a surface which is at a distance greater than 16.5m from the source of sound ii) Reverberation: It is the persistence of sound due to multiple reflections in a hall even after the source of sound is cut-off. Reverberation creates confusion & affects the quality of sound. Proper reverberation time can be adjusted by providing sound absorbing material in the hall. iii) Reverberation time: The time for which sound persists in a hall even after the source of sound is cut off is called as reverberation time. iv) Creep: Creep occurs because of reflections of sound along a curved surface (dome shape surface). If the source of sound is close to the dome then energy of sound moves along the ceiling without absorption & can be heard distinctly at the other side v) External noise: The outside noise can mix up with the sound of speech or music in the hall and create confusion for the audience. This can be decreased by making the hall sound proof and constructing small sound proof cabins for machinery and type-writers etc.		
	e)	**State any four applications of photoelectric cell.** **Any four application.** i) Photoelectric cell is used in lux-meter to measure the intensity of light. ii) It is used to switch on and off automatically the street lights. iii) It is used for automatic control of traffic signals iv) It is used in recording and reproduction of sound during shooting of a film. v) Photoelectric cells are used in television sets, fire alarms. vi) It is used in detecting flaws in metals vii) Photoelectric cell is used in Burglar alarm. ***viii) OR any relevant application.***	4	4

Que. No.	Sub. Que	Stepwise Solution	Marks	Total Marks
2)	f)	**State any four uses of X-rays.** **Any four uses.** 1) X- rays are used to detect the cracks in the body of aeroplane or motor car. 2) X- rays are used to detect the manufacturing defects in rubber tyres or tennis ball in quality control. 3) X – rays are used to detect flows or cracks in metal jobs. 4) X- rays are used to distinguish real diamond from duplicate one. 5) X- rays are used to detect smuggling gold at airport and docks (ship) yard. 6) X-rays are used to detect cracks in the wall. 7) X- ray radiography is used to check the quality of welded joints. 8) X – Rays are used in surgery to detect bone fractured. 9) X- Rays are used to cure skin diseases and destroy tumours. 10) X – Rays are used to cure diseases like cancer. 11) X – Rays are used to detect bullets position inside the body. **Any relevant application may be consider.**	4	4

Que. No.	Sub. Que.	Stepwise Solution	Marks	Total Marks
3)		**Attempt any FOUR of the following:**		16
	a)	**The photoelectric work function of certain metal is $3X10^{-19}$ Joules. Calculate its threshold frequency. If Planck's constant (h) = $6.62 X 10^{-34}$Js.**		4
		Formula & substitution	2	
		Answer with unit	2	
		Given : $w_0 = 3 \times 10^{-19}$ J h = 6.62×10^{-34} Js υ_0 = ?		
		$w_0 = h \upsilon_0$		
		$\nu_0 = \frac{w_0}{h}$		
		$\nu_0 = \frac{3\times10^{-19}}{6.62\times10^{-34}}$		
		$\upsilon_0 = 0.453 \times 10^{15}$ Hz		
				4
	b)	**Define i) Impulse ii) Stopping potential iii) Photoelectric work function iv) Power**		
		Each Defination	1	
		i) Impulse:		
		It is defined as change in momentum.		
		OR		
		It is defined as product of large force on a body and very small time for which force acts.		
		ii) Stoping potential:- It is the negative potential at which photoelectric current becomes zero.		
		iii) Photoelecrtic work function:- Photoelecrtic work function of a metal is the energy required to detach (seprate) the electron from metal.		
		iv) Power:- Power is defined as the rate of doing work.		

Que. No.	Sub. Que.	Stepwise Solution	Marks	Total Marks
3)	c)	**What is a Photometer? Explain Bunsen's grease spot photometer.** **Meaning** **Expination and diagram** **Photometer**: It is an instrument for compering the intensity of light. If two source of light of illuminating powers I_1 & I_2 are kept at a distance r_1 and r_2 from a screen then the intensities of illumination at a point on the screen due to two source are $\frac{I_1}{I_2}=\frac{r_1^2}{r_2^2}$  **Construction-** It consists of a white paper called screen with a grease spot at its center. This screen is mounted centrally in a wooden box. The grease spot is easily differentiated from rest of the screen because most of the light transmits through grease spot than the rest of the screen. Two mirrors are adjusted in inclined position on either side of the screen such that both sides of the screen can be seen at a time. The box is provided with two co-axial windows. The box is mounted on a vertical stand of adjustable height. An observer can watch the screen through central window. **Working:** The two sources of intensity I_1 & I_2 are placed at a distance r_1 & r_2 from the screen respectively. Position of source are adjusted such that image of the grease spot seen in two mirrors is equally bright. Then the luminous intensities of 2 sources can be compared using relation $\frac{I_1}{I_2}=\frac{r_1^2}{r_2^2}$ The same procedure is repeated by changing the position of two sources.	1 $1\frac{1}{2}$ **Each**	4

Que. No.	Sub. Que.	Stepwise Solution	Marks	Total Marks
3)	d)	**Obtain the formula for distance travelled by a body in n^{th} second along a straight line.** The distance travelled by a body in n^{th} second can be obtained by finding the distance travelled by a body in n^{th} second and (n-1) sec. s = distance travelled in n^{th} second. s'= distance travelled in (n-1) second. a = uniform acceleration. By using second equation of motion. $s = ut + (1/2)\, at^2$ then put t = n $s = un + (1/2)\, an^2$ $s' = u(n-1) + (1/2)\, a(n-1)^2$ Here t = n-1 distance travelled in n^{th} second $s^n = s - s'$ $s^n = (un + (1/2)\, an^2) - (u(n-1) + (1/2)\, a(n-1)^2)$ **$s^n = u + (a/2)(2n-1)$**	4	4
	e)	**A hall of volume 5000 m^3 has reverberation time of 2 seconds. If the absorbing surface in the hall amounts to 3320 m^2, determine the coefficient of absorption.** **Formula with substitution** **Answer with unit** Given: V=5000 m^3 t =2 sec $\Sigma S = 3320\ m^2$ a=? Formula : $t = \frac{0.164\, V}{\Sigma as}$ $a = \frac{0.164 \times V}{t\ \Sigma s}$ $a = \frac{0.164 \times 5000}{2 \times 3320}$ a = 0.123 0.W.U	2 2	4

Que. No.	Sub. Que.	Stepwise Solution	Marks	Total Marks
3)	f)	**State any four properties of ultrasonic waves** **Each Property** i) Frequency of these sound waves is more than 20kHz. ii) It has shorter wavelength. iii) They carry high amount of sound energy. iv) The speed of propagation of ultrasonic waves increases with increase in frequency. v) They show negligible diffraction. vi) Ultrasonic waves travel over long distance without considerable loss. vii) Ultrasonic waves undergo reflection and refraction at the separation of two media. viii) If it passed through fluid, then temperature of the fluid increases. ix) They travel with constant speed through a homogeneous medium. x) They posses certain vibrations which are used as good massage action in case of muscular pain.	1	4