



INDIRA GANDHI INSTITUTE OF TECHNOLOGY, SARANG

DEPARTMENT OF PHYSICS

Date: 27-01-2021 1st internal Examination FM: 15 Time: 1Hr

Students are requested to upload the good quality scanned copy of the Answer Booklet (Single PDF/image file) in the Google Form provided. The link for Google Form has been pasted in the question email.

(Answer any three questions)

1. Show that $\vec{\nabla}V(r) = \hat{r} \frac{\partial V}{\partial r}$. Where \hat{r} is the unit vector of the position vector [5]
2. Find $\text{Div. } \vec{A}$. Where $\vec{A} = \vec{r}V(r)$. Here \vec{r} is the position vector. [5]
3. A body oscillates with simple harmonic motion obeying the equation
 $x = 10 \cos \{0.5\pi t + \frac{\pi}{3}\}$ m
Calculate the velocity and acceleration of the body at time $t=4$ second and the frequency and time period of the harmonic motion. [5]
4. The amplitude of an under damped oscillator of frequency 100 per second falls to 1/10 of its initial value after 1000 cycles. Calculate the (a) damping coefficient, (b) logarithmic decrement and (c) time in which energy falls to 1/10 of its original value. [5]

Contact No:

N. Baral: 7978605983

A Pattanaik: 9861939526

D. Behera: 9853380621



SET-I

HOD Official Email id: hod.csea@igitsarang.ac.in

Phone Nos.:

(a). HOD: 9861414972

(b) Controller of Examination: 9861110442

Total Number of Pages: 1		MTECH / MCA / BTECH
		Subject Code: MockOdd2021
1 st Semester Regular Examination May 2021		
Subject Name: General knowledge		
Branch: B.Tech, MCA, M.Tech		
Time: 30 Min		
Max Marks: 0		
Question Code:		
All the questions are compulsory		
The figures in the right-hand margin indicate marks.		
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Q1	<p>The director of Hind Circus has decided to add a new performance called the monkey dance to his show. The monkey dance is danced simultaneously by N monkeys. There are N circles drawn on the ground.</p> <p>There are N arrows drawn between the circles in such a way that for each circle, exactly one arrow begins at that circle and exactly one arrow ends at that circle. No arrow can both begin and end at the same circle.</p> <p>When the show begins, each monkey sits on a different circle. At each whistle of the ringmaster, all the monkeys simultaneously jump from one circle to the next, following the arrow leading out of the current circle. This is one step of the dance. The dance ends when all the monkeys have simultaneously returned to the circles where they initially started.</p> <p>The director wishes the dance to last as many steps as possible. This can be achieved by drawing the arrows intelligently.</p> <p>For each of the three values of N given below, what is the maximum number of steps that the monkey dance can be made to last by drawing arrows appropriately?</p> <p>(a) 9 (b) 12 (c) 15</p>	
Q2	<p>A sequence of positive integers, $a[1], a[2], a[3], \dots, a[n]$ is called a Special Sequence, if $a[1]$ divides $a[2]$, $a[2]$ divides $a[3]$, and so on until $a[n-1]$ divides $a[n]$, and if all the elements are distinct. For example, (2, 4, 8, 32) is a Special Sequence. But (4, 2, 8) is not, because 4 does not divide 2. Similarly (2, 4, 4, 8) is also not Special, because the elements are not distinct. You need to find the number of Special Sequences such that all the elements of the sequence are from the set $\{1, 2, \dots, K\}$. Suppose $K = 3$. The Special Sequences possible are (1), (2), (3), (1, 2), (1, 3). So the answer would be 5.</p> <p>Find the answer for the following values of K:</p> <p>(a) $K = 15$ (b) $K = 19$ (c) $K = 22$</p>	