Q1. Consider three boxes, each containing 10 balls labelled 1, 2, 3, ..., 10. Suppose one ball is randomly drawn from each of the boxes. Denote by  $n_i$ , the label of the ball drawn from the  $i^{th}$  box, (i = 1, 2, 3). Then, the number of ways in which the balls can be chosen such that  $n_1 < n_2 < n_3$  is \_\_\_\_\_

(Marks: 4.0)

- O (A) 120
- O (B) 240
- O (c) 164
- O (D) 82



Q2. Let P(x) be a function defined on  $\mathbb{R}$  such that P'(x) = P'(1-x) for all  $x \in [0,1]$ , P(0) = 1 and P(1) = 41 then,  $\int_0^1 P(x) dx = 1$ 

(Marks: 4.0)

 $\bigcirc$  (A)  $\sqrt{41}$ 

○ (B) 41

O (c) 42

O (D) 21

The value of 
$$\left(\frac{1+cos\left(\frac{\pi}{n}\right)+i\,sin\left(\frac{\pi}{n}\right)}{1+cos\left(\frac{\pi}{n}\right)-i\,sin\left(\frac{\pi}{n}\right)}\right)^n=\underline{\hspace{1cm}}$$



Q5. Which of the following is a viable particulate?

- O (A) Smoke
- O (B) Moulds
- O (c) Dust
- O (D) Mist



Q6. Which one of the following gives positive carbylamine test?

- O (A) 2,4-dimethylaniline
- (B) N,N-dimethylaniline
- (c) N-methyl-4-methylaniline
- O (D) N-methyl aniline



- Q9. A simple pendulum of length L has a period of T on the surface of earth (radius = R). What should be the length of the pendulum, in order to have the same period at an altitude of R above the surface of earth?
- (A) 4L
- (B) L/4
- (c) L/2
- (D) 2L



- Q10. A circuit connected to an ac source of emf e = e<sub>0</sub> sin(100 t) with t in seconds, gives a phase difference of π/4 between the emf e and current I. Which of the following circuits will exhibit this?
- $\bigcirc$  (a) RL circuit with R = 1 k $\Omega$  and L = 1mH
- $\bigcirc$  (B) RC circuit with R = 1 k $\Omega$  and C = 1 $\mu$ F
- $\bigcirc$  (c) RC circuit with R = 1 k $\Omega$  and C = 10 $\mu$ F
- $\bigcirc$  (D) RL circuit with R = 1 k $\Omega$  and L = 10mH

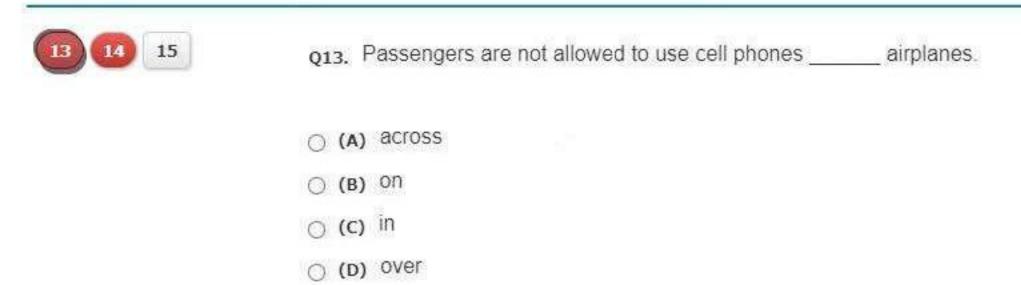


Q11.

A screen is placed 2 m away from a narrow slit which is illuminated with light of wavelength 600 nm. If the first minima lies at a distance of 5 mm on either side of central maximum calculate the slit width (in µm).



Q12. A stone is dropped from the top of a tower 96 m high. At the same time another stone is thrown upwards with a velocity of 24 m/s from the foot of the tower. When will the two stones meet (in seconds)?





- Q14. Identify the grammatically correct sentence among the following:
- O (A) Despite the differences in their age, they were close friends.
- O (B) Despite of the difference in their ages, they were close friends.
- O (c) Despite the difference in their ages, they were close friends.
- (D) In spite the difference in their ages, they were close friends.

