1 2

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)

- (A) 120
- (B) 240
- (C) 164
- (D) 82

1 2

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, $\int_0^1 P(x)dx =$ (Marks : 4.0)

- (A) $\sqrt{41}$
- (B) 41
- (C) 42
- (D) 21

3 4

Q3. The value of $\left(\frac{1+cos\left(\frac{\pi}{n}\right)+i\ sin\left(\frac{\pi}{n}\right)}{1+cos\left(\frac{\pi}{n}\right)-i\ sin\left(\frac{\pi}{n}\right)}\right)^{n} =$ _____

3 4

Q4. The standard deviation of a distribution is 30 and each item is raised by 3. Then the new standard deviation is

3 4

Q5. Which of the following is a viable particulate?

- (A) Smoke
- (B) Moulds
- (C) Dust
- (D) Mist

3 4

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

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

3 4

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

3 4

Q10. A circuit connected to an ac source of emf $e = e_0 \sin(100\ t)$ with t in seconds, gives a phase difference of $\pi/4$ between the emf e and current I. Which of the following circuits will exhibit this?

- ○ **(A)** RL circuit with R = 1 kΩ and L = 1mH
- ○ **(B)** RC circuit with R = 1 kΩ and C = 1μF
- ○ **(C)** RC circuit with R = 1 kΩ and C = 10μF
- ○ **(D)** RL circuit with R = 1 kΩ and L = 10mH

3 4

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).

3 4

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)?

13 14 15

Q13. Passengers are not allowed to use cell phones _____ airplanes.

- (A) across
- (B) on
- (C) in
- (D) over

13 14 15

Q14. Identify the grammatically correct sentence among the following:

- (A) Despite the differences in their age, they were close friends.
- (B) Despite of the difference in their ages, they were close friends.
- (C) Despite the difference in their ages, they were close friends.
- (D) In spite the difference in their ages, they were close friends.

13 14 15

Q15. This exam is her best chance to prove her credentials. Everyone _____ and hoping for the best.

- (A) is keeping their fingers crossed
- (B) washing the dirty linen
- (C) keeping their fingers closed
- (D) washing their hands off