V.P.M's B. N. Bandodkar College of Science, Thane
S.Y.J.C First Terminal Examination October 2018
Subject: Mathematics & Statistics

Date: 29.10.2018
Day: Monday

Time: 08.00 am to 10.00 am
Marks: 50

Note: 1) All questions are compulsory.
2) The question paper consist of 19 questions divided into four sections A, B, C, D.
3) Section A contains 4 MCQ questions of 1 mark each.
Section B contains 5 questions of 2 marks each.
Section C contains 4 questions of 3 marks each.
Section D contains 6 questions of 4 marks each.
4) Use of logarithmic tables is not allowed.
5) Use of Calculator is not allowed.
6) In LPP only rough sketch of graph is expected. Graph paper is not necessary.

Section – A

(04)

Select and write the most appropriate answers from the given alternatives in each of the following question

1. $p \wedge (q \vee \sim p)$ is equivalent to

   a) $p \wedge q$ b) $\sim p \wedge \sim q$ c) $\sim p \vee \sim q$ d) $p \vee q$

2. The direction cosines of the line which bisects the angle between positive direction of y & z axes are

   a) $\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}, 0$ b) $0, \frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}$ c) $-\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}}, 0$ d) $\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}$

3. If the p.d.f of a continuous random variable X is

   $f(x) = 3(1 - 2x^2)$; $0 < x < 1$
   $= 0$; otherwise

   then $p\left(\frac{1}{4} < X < \frac{1}{3}\right)$ is

   a) $\frac{216}{864}$ b) $\frac{179}{216}$ c) $\frac{179}{864}$ d) $\frac{179}{432}$

4. If $E(X) = 6, Var(X) = 4.2$, then the value of 'n' is

   a) 10 b) 20 c) 5 d) 30

Section – B

(10)

5. Using truth table examine the statement patterns are tautology, contradiction or contingency. $(p \vee q) \vee r \leftrightarrow p \vee (q \vee r)$
6. Find the direction ratios of a vector perpendicular to the two lines whose direction ratios are $-2,1,-1$ and $-3,-4,1$
7. Find the approximate value of : $sin31^0, given\ 1^0 = 0.0175^c$ & $cos30^0 = 0.8660^c$

OR

7. Find the equation of tangent to the curve $y = 3x^2 - x + 1$ at $p(1,3)$
8. Find the general solution of differential equation $y^3 - \frac{dy}{dx} = x^2 \frac{dy}{dx}$
9. Find the principal solutions of $tanx = -\sqrt{3}$.

Section – C

(12)

10. Following is the distribution function $F(x)$ of a discrete r.v.x :-

x	1	2	3	4	5	6
F(x)	0.2	0.37	0.48	0.62	0.85	1

i) Find the probability distribution of X. ii) Find $p(X \leq 3)$ iii) $P(2 < X < 5)$

11. If A, B, C, D are (1,1,1) (2,1,3), (3,2,2), (3,3,4) respectively, then find the volume of the parallopiped with AB, AC and AD as the concurrent edges.

12. Evaluate: $\int \frac{sin\theta+2cos\theta}{3sin\theta+4cos\theta}\, d\theta$

OR

12. Evaluate: $\int \frac{x^3+4x^2+7x+2}{x^2+3x+2}\, dx$

13. Suppose that 80% of families own a television set. If 10 families are interviewed at random, find the probability that

    i) Seven families own a television set.

    ii) At most three families own a television set.

Section – D

(24)

14. Minimize $Z = 6x + 21y$, subject to
$x + 2y \geq 3, x + 4y \geq 4, 3x + y \geq 3, x \geq 0, y \geq 0$

15. In ΔABC, with the usual notations, prove that

$$2\left\{asin^2\frac{C}{2} + csin^2\frac{A}{2}\right\} = a + c - b$$

OR

15. Show that $tan^{-1}\left(\frac{1}{5}\right) + tan^{-1}\left(\frac{1}{7}\right) + tan^{-1}\left(\frac{1}{3}\right) + tan^{-1}\left(\frac{1}{8}\right) = \frac{\pi}{4}$

16. Find the shortest distance between the lines.

$$\frac{x+1}{7} = \frac{y+1}{-6} = \frac{z+1}{1} \; and \; \frac{x-3}{1} = \frac{y-5}{-2} = \frac{z-7}{1}$$

OR

16. Find the equation of the plane passing through the line of intersection of the planes.

$2x - y + z = 3, 4x - 3y + 5z + 9 = 0$ and parallel to the line $\frac{x+1}{2} = \frac{y+3}{4} = \frac{z-3}{5}$

17. What is the largest size of rectangle that can be inscribed in a semicircle of radius 1 unit, so that two vertices lie on the diameter?

18. Solve the equations by the method of inversion

$$x + y + z = -1, x - y + z = 2, x + y - z = 3$$

19. Find, $\frac{dy}{dx}$, if $y = (sinx)^{tanx} + (cosx)^{secx}$

OR

19. Find, $\frac{dy}{dx}$, if $y = sin^{-1}\left(\frac{\sqrt{1+x}+\sqrt{1-x}}{2}\right)$

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