1B1N21077 (Pages : 3) Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester B.Sc Mathematics Degree Examination, November 2021

BMT1B01 – Basic Logic and Calculus – I

(2019 Admission onwards)

Time: 2.5 hours Max. Marks : 80

Section A
All questions can be attended
Each question carries 2 marks.

1. Construct a truth table for the proposition $(p \vee \neg q) \rightarrow q$.
2. What is a contrapositive law?
3. Give counter example to disprove the statement '*The square of every real number is positive*'.
4. Find the domain of the function $f(x) = \frac{2x+1}{x^2-x-2}$.
5. Let f and g be functions defined by $f(x) = x + 1$ and $g(x) = \sqrt{x}$. Find the functions $g \circ f$ and $f \circ g$.
6. State Squeeze theorem.
7. Find $\lim_{x \to \frac{\pi}{4}} (x \, tanx)$.
8. Find the equation of the tangent line to the graph of the function $f(x) = x^2 + 1$ at the point $(2, 5)$.
9. Let $y = x^2 + 1$. Find Δy when x changes from 2 to 2.02.
10. Find the critical numbers of $f(x) = x - 3x^{\frac{1}{3}}$.
11. Find the dimensions of a rectangle with a perimeter of 100 m that has the largest possible area.
12. Find f by solving the initial value problem, $f'(x) = 3x^2 - 6x$, $f(2) = 4$.
13. Evaluate $\sum_{k=1}^{5} k(k+1)$.

14. Find the area of the region under the graph of $f(x) = x^3 + x$ on $[0, 1]$.

15. Evaluate $\int_{-2}^{2} \frac{sinx}{\sqrt{1+x^2}}\, dx$.

(Ceiling: 25 Marks)

Section B
All questions can be attended
Each question carries 5 marks.

16. Show that $\neg p \to (q \to r)$ and $q \to (p \vee r)$ are logically equivalent.

17. Define a contradiction and determine whether $[\neg p \leftrightarrow (p \vee \neg p)]$ is a contradiction.

18. Let $f(x) = \begin{cases} 1 & \text{if } x \geq 0 \\ -1 & \text{if } x < 0 \end{cases}$ Prove that $\lim_{x \to 0} f(x)$ does not exist.

19. Find the linearization of $f(x) = \sqrt{x+3}$ at $a = 1$, and use it to approximate the numbers $\sqrt{3.9}$ and $\sqrt{4.1}$.

20. Verify Rolle's theorem for the function $f(x) = x^3 - 9x$ on the interval $[-3, 3]$.

21. Find the horizontal and vertical asymptotes of the graph of the function $f(t) = \frac{t^2 - 2}{t^2 - 4}$.

22. Determine the average value of the function of $f(x) = 2x^2 - 3x$ over the interval $[-1, 2]$.

23. A car moves along a straight road with velocity function

$$v(t) = 2t^2 + t - 6,\ 0 \leq t \leq 8$$

where $v(t)$ is measured in feet per second. Find the displacement of the car between $t = 0$ and $t = 3$.

(Ceiling: 35 Marks)

Section C
Answer any two Question
Each question carries 10 marks.

24. (a) State and prove De Morgan's laws of logic.

(b) Use De Morgan's law find the negation of the statement '*Paris is in France and London is in England*'.

25. (a) Let $f(x) = \begin{cases} ax+b & \text{if } x < 1 \\ 4 & \text{if } x = 1 \\ 2ax-b & \text{if } x > 1 \end{cases}$

Find the values of a and b that will make f continuous on $(-\infty, \infty)$.

(b) State intermediate value theorem for continuous functions and use it to prove that there exist at least one root of the equation $x^4 - 2x^3 - 3x^2 + 7 = 0$, in the interval (1,2).

26. (a) State and prove The Fundamental Theorem of Calculus (Part-I)

(b) Find the derivative of the function $F(x) = \int_0^x \sqrt{3t+5}\, dt$.

27. Let $f(x) = 2x^3 - 3x^2 - 12x + 12$.

(a) Find the intervals on which f is increasing or decreasing.

(b) Find the relative extrema of f.

(c) Determine the concavity of the graph of f.

(d) Find the inflection points of f.

(e) Sketch the graph of f.

(2×10 = 20 Marks)

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester B.Sc Degree Examination, November 2020

BPH1C01 - Properties of Matter & Thermodynamics

(2019 Admission onwards)

Time: 2 hours Max. Marks : 60

The symbols used in this question paper have their usual meanings

Section A – Short Answer type

(Answer all questions in two or three sentences, each correct answer carries a maximum of 2 marks)

1. State Hooke's law.
2. Define three elastic modulii.
3. A wire having a length L requires a force F to stretch by l .If it is cut into two parts of each length L/2, what is the force required to stretch a piece by $2l$?
4. What are cohesive and adhesive forces? Give one example for each.
5. Define angle of contact?
6. State Stokes Law.
7. Distinguish between intensive and extensive coordinates.
8. What is internal energy? State and explain Zeroth law of thermodynamics?
9. State Kelvin-Planck and Clausius statement of Second law of thermodynamics?
10. What are Helmholtz and Gibbs function? Write down the formulae?
11. What is latent heat?
12. State First law of thermodynamics? Write the differential form of First law.

(Ceiling – 20)

Section B – Paragraph/Problem type

(Answer all questions in a paragraph of about half a page to one page, each correct answer carries a maximum of 5 marks)

13. A torsion pendulum is set up by suspending a disc of mass 1.2 kg and radius 0.1 m at the lower end of a wire of length 1m and radius 0.72 mm. the period of torsional oscillation is 2 sec. Calculate the rigidity modulus of the material of the wire.
14. A cantilever shows a depression of 1 cm at the loaded end, What is the depression at its midpoint?
15. Calculate the energy needed to break a liquid drop of radius 'R'and surface tension 'T' in to n equal small drops.
16. A Carnot's engine whose lower temperature heat (sink) is at 27 0^0C has its efficiency 40%. What is the temperate of the heat source? By how much should the temperature of the source be raised if the efficiency if to be raised to 70 %?
17. Derive the equation for work done in an adiabatic process.
18. Show that Cp-Cv = R.
19. What is meant by phase transitions? Write and explain Clausius- Clayperon equation of phase transition?

(Ceiling – 30)

Section C- Essay type

(Answer any one question, each question carries 10 marks)

20. Describe the working of a Carnot's engine. Define efficiency of a heat engine. Derive an expression for efficiency of a Carnot engine.
21. Derive Poiseuille's equation for the rate of flow of a liquid through a capillary tube.

(1x 10 = 10 Marks)

1B1N21107 (Pages : 2) Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester B.Sc Degree Examination, November 2021

BST1C01 – Introductory Statistics

(2019Admission onwards)

Time: 2 hours Max. Marks : 60

Part A
Each question carries 2 Marks.
Maximum Marks that can be scored in this Part is 20

1. Compare less than and greater than Ogives.
2. What do you mean by deciles?
3. Define harmonic mean.
4. What is the variance of the observations 7, 9, 11?
5. How will you find range of a grouped frequency distribution?
6. What is meant by relative measures of dispersion?
7. Define mean deviation.
8. Distinguish between discrete and continuous data. Give examples.
9. What is combined standard deviation?
10. Define Regression.
11. Write any two features of Indian statistical system.
12. The average weight of 40 males was found to be 80 and that of a group of 30 females were 50. Find the combined mean weight of the 70 persons.

Part B
Each question carries 5 Marks.
Maximum Marks that can be scored in this Part is 30

13. Explain Skewness. What are the different types of Skewness? Explain any one of them.
14. Discuss the graphical methods used for representing a frequency distribution
15. Explain the responsibilities of CSO.
16. Define row moment and central moment. State and prove the relation between them?

17. Explain the principle of least squares method of fitting of a second-degree curve of the form $y = a + bx + cx^2$ for n pairs of values.
18. Explain any two methods to estimate the secular trend with examples?
19. Distinguish between primary data and secondary data.

Part C

Answer any one question and carries 10 Marks.

20. (a) Define Kurtosis. What are the different types of Kurtosis?

    (b) Calculate coefficient of kurtosis $\beta 2$ for the following frequency Distribution

Class:	0-10	10-20	20-30	30-40	40-50	50-60
Frequency:	2	5	8	6	4	1

21. What are index numbers? Briefly discuss the problems in construction of index numbers.