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2B2M21411 (Pages : 2) Reg. No:..............................

Name: ....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Second Semester BSc Degree Examination, March/April 2021

BMT2B02 – Calculus – 2

(2020 Admission onwards)

Time: 2 ½ hours Max. Marks : 80

SectionA(*Short Answer type)*

Ceiling (Maximum marks – 25Marks

Each question carries 2 marks

1. Find the volume of the solid obtained by revolving the region under the graph of $y = \sqrt{x}$ on [0, 2] about the x – axis.
2. State the laws of logarithms.
3. Find the derivative of $x^2\ln(2x)$.
4. Solve $\ln(2x + 5) = 4$.
5. Find $\int \frac{1}{2x+1}\, dx$.
6. Evaluate $\int_0^3 2^x\, dx$.
7. Find the derivative of $y = sin^{-1}3x$.
8. Evaluate $\cos^{-1}(\cos(3\pi/2))$.
9. Prove the identity $\cosh^2x + \sinh^2x = \cosh 2x$.
10. Define Improper Integrals.
11. Define Monotonic Sequence with an example.
12. Define the term partial sum and when a series $\sum_{n=1}^{\infty} a_n$ is said to be convergent.
13. State the integral Test for the convergence or divergence of the series $\sum_{n=1}^{\infty} a_n$.
14. Find the radius of convergence and interval of convergence of $\sum_{n=0}^{\infty} \frac{(-1)^n}{(2n)!} x^{2n}$.
15. Find the Maclaurin series of $f(x) = \cos x$.

(Ceiling =25Marks)

Section B(*Paragraph type)*

Ceiling (Maximum marks) – 35Marks

Each question carries 5 marks

16. Find the area of the region bounded by the graphs of $y = 2 - x^2$ and $y = -x$.
17. Show that $sinh^{-1}x = \ln\left(x + \sqrt{x^2 + 1}\right)$.
18. Find the derivative of $f(x) = x^2\log(e^{2x} + 1)$.

19. Using l'Hopital' Rule

a) Evaluate $\lim_{x \to 1^+} \frac{\sin \pi x}{\sqrt{x-1}}$.

b) Evaluate $\lim_{x \to \infty} \frac{\ln x}{x}$..

20. Prove that if $\sum_{n=1}^{\infty} a_n$ converges, then $\lim_{n\to\infty} a_n = 0$. Is the converse true? Why?

21. Determine whether the series converge or diverge $\sum_{n=1}^{\infty} (-1)^{n-1} \frac{3n}{4n^2-1}$.

22. Determine whether the series $\sum_{n=1}^{\infty} (-1)^{n-1} \frac{2^{n+3}}{(n+1)^n}$ is absolutely convergent, conditionally convergent or divergent

23. Find the Taylor series for f(x) = ln x at x = 1, and determine its interval of converg

(Ceiling =35

Section C (*Essay type)*

Answer any two questions

Each question carries 10 marks

24.

a) Find the length of the graph $f(x) = \frac{1}{3}x^3 + \frac{1}{4x}$ on the interval [1, 3].

b) Find the area of the surface obtained by revolving the graph of the function $x = y^3$ on the interval [0, 1] about the y-axis.

25.

a) Find $\int \frac{1}{x\sqrt{x^4-16}} dx$.

b) Using l'Hopital' rule, evaluate $\lim_{x \to 0^+} (\frac{1}{x})^{\sin x}$.

26.

a) For what values of p the Series $\sum_{n=1}^{\infty} \frac{1}{n^p}$ converges and diverges?(not needed pr

b) State the limit Comparison Test.

c) Determine whether the series $\sum_{n=1}^{\infty} \frac{2n^2+n}{\sqrt{4n^7+3}}$ converges or diverges.

27. a) What is an absolutely convergent series?

b) Prove that every absolutely convergent series is convergent.

c) Is the converse true? Why?

(2 X 10 =20

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Name: ....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Second Semester B.Sc Degree Examination, March/April 2021

BPH2C02 – Optics , Laser, Electronics & Communication

(2020 Admission onwards)

Time: 2 hours Max. Marks : 60

Section A

Answer all questions. Answer in two or three sentences. Each correct answer carries a maximum of two marks.

1. What are coherent sources? Give an example.
2. What are Newton's rings? Give two of its uses.
3 State and explain grating law.
4. Distinguish between Fraunhofer and Fresnel's diffraction.
5. What is a half wave plate? What is its use?
6. Draw the intensity distributioncurve of the single slit diffraction pattern
7. Obtain the relation between current amplification factors a and b
8. Draw the diagram of exclusive OR gate. Also draw its truth table.
9. What is negative feedback? What is its need?
10. What is stimulated emission?
11. Distinguish between **e** rays and **o** rays.
12. What is specific rotation?

(Ceiling: 20 Marks)

Section B (Paragraph/Problem)

(Answer all questions in a paragraph of about half a page to one page. Each correc carries a maximum five marks)

13. What are constructive and destructive interferences? Give the conditions.
14. In Newton's Ring experiment the radius of curvature of the curved side of a plan lens is 100cm. Wavelength of light used is $6x10^{-5}$ cm. What will be the radius of 9 10^{th} brightrings?
15. If the critical angle of glass air boundary is 42^0, calculate the polarising angle for
16. What are the conditions for brightness and darkness of normal incidence of light plane film producing interference?
17. Write a short note on Ruby laser.
18. How will you distinguish between planes, elliptically and circularly polarised ligl
19. Explain the working of a transistor oscillator.

(Ceiling:3

Section C (Essay)

Answer anyone in about two pages .Each question carries ten marks)

20. Give the theory of plane diffraction grating and explain how it is used to measure wavelength of light.
21 Describe the principle and working of a full wave rectifier. Obtain the expression efficiency and ripple factor.

(1x10=10

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Name: ....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Second Semester BSc Degree Examination, March/April 2021

BST2C02 – Probability Theory

(2020 Admission 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. Give axiomatic definition to probability.
2. State the addition theorem for 3 events.
3. Given that P(A)=$\frac{1}{4}$,P(B)=$\frac{1}{2}$ and $P(B|A)=\frac{1}{3}$,then what is $P(A|B)$?
4. Define independence of 2 events. If A and B are 2 events, show that $\overline{A}$ and $\overline{B}$ are independent
5. Define the distribution function of a continuous random variable.
6. Let X be the number of heads turns up when two fair coins are tossed. Write the probability mass function of X.
7. If f(x) = k (x+1), x = 0, 1, 2 is a probability mass function, find the value of 'k' and evaluate f(x) at x= 0,1 and 2.
8. Find the expectation of the number on a die when thrown.
9. How do you find moments from m.g.f?
10. Find the mean and variance of X if its p.d.f is f(x) $= me^{-mx}$, $0 \le x < \infty$, m>0.
11. Define conditional mean and conditional variance in discrete and continuous cases.
12. The joint p.d.f of X and Y is $f(x,y)=\frac{1}{4}(x+y)$; $x = 0,1$ *and* $y = 0,1$ .Find the marginal p.d.f's of X and Y.

Part B

Each question carries 5 Marks.

Maximum Marks that can be scored in this Part is 30

13. What do you mean by mutual independence and pairwise independence in the case of three events? Give an example to show that pairwise independence need not imply mutual independence.
14. A box contains 8 red, 3 white and 9 blue balls. If 3 balls are drawn at random determine the probability that (a) all three are blue (b) 2 are red and 1 is white (c) at least one is white and (d) one of each colour is drawn.

15. The distribution of a r.v X is given by $F(x)=\begin{cases}0 & x<0\\ 1-e^{-x} & x\geq 0\end{cases}$ .Find the

Determine $P(2<X<4)$.

16. If X is a random variable having distribution function F(x) , show that the p.d.f

$Y=F(X)$ is $g(y)=\begin{cases}1 & 0\leq x\leq 1\\ 0 & elsewhere\end{cases}$

17. State and prove addition theorem and multiplication theorem on mathematical e

in continuous case.

18. Find the characteristic function of $f(x)=\theta e^{-\theta x}$ $\theta>0,\ x>0$. Hence obtain th

and variance of X.

19. Prove that if X and Y are any two random variables, $V(X-Y)=V(X)+V(Y)-2Cov$

Part C

Answer any one question and carries 10 Marks.

20. State and prove Bayes' theorem. The chances of X, Y and Z becoming the ma certain company are in the ratio 4:2:3. The probability that bonus schem introduced if X, Y and Z become managers are 0.3, 0.05 and 0.8. The bonus sc introduced. What is the probability that X was appointed as the manager?

21. The following table presents the bivariate distribution of a pair of random (X,Y).Calculate E(X), E(Y) and $E(X^2\mid Y)$.Also find the covariance and c coefficient between X and Y and $V(X\mid Y=1)$.

xy	0	1	2
0	0.01	0.01	0.02
1	0.22	0.10	0.43
2	0.07	0.08	0.06