

B.Sc. Semester - 1 (CBCS) Examination
Feb/Mar. -2021 (OLD COURSE)
MATHEMATICS (CORE)

Time: 1:30 Hours

Marks: 42

Instructions:

1. Figures to the right indicate marks.
2. There are five questions in the question paper.
3. Answer any three of the following questions.

-
- Q.1(A) Answer in short. (04)
1. Write the formula of Lagrange's theorem.
 2. Find the value of c, if Roll's theorem is applicable to $f(x)=\sin x$, $x \in [0, \pi]$.
 3. Check whether the function $f(x)=6(x-2)^2$, $x < 2$ is increasing or decreasing.
 4. Write expansion of $\sin x$ in ascending power of x.
- Q.1(B) Answer any one out of two. (02)
1. Show that $f(x) = x^3 + 6x^2 + 12x - 7$ is strictly increasing in every interval.
 2. State Alternative form of Cauchy's mean value theorem.
- Q.1(C) Answer any one out of two. (03)
1. Obtain expansion of $\cos x$ in ascending power of x.
 2. Obtain expansion of $\tan^{-1} x$ in ascending power of x.
- Q.1(D) Answer any one out of two. (05)
1. In usual notation prove that $e^x \cdot \cos x = 1 + x - \frac{x^3}{3} - \frac{x^4}{6} - \frac{x^5}{5} - \dots$
 2. Expand $\log(1 + \sin x)$ upto first three terms in ascending power of x.
- Q.2(A) Answer in short. (04)
1. Evaluate $\lim_{x \rightarrow 0} \frac{x}{\tan^{-1} x}$.
 2. Evaluate $\lim_{x \rightarrow 0} \frac{\sin 5x}{\sin 3x}$.
 3. State general form of linear differential equation.
 4. Find general solution of $\sqrt{1+x^2} dy + \sqrt{1+y^2} dx = 0$.
- Q.2(B) Answer any one out of two. (02)
1. Evaluate $\lim_{x \rightarrow 0} \frac{\log x^2}{\cot x^2}$.
 2. Solve: $e^x \tan y dx + (1 - e^x) \sec^2 y dy = 0$.
- Q.2(C) Answer any one out of two. (03)
1. Evaluate: $\lim_{x \rightarrow \pi/2} (\sin x)^{\tan x}$.
 2. Solve: $(x^2 + 2y^2) dx - xy dy = 0$.
- Q.2(D) Answer any one out of two. (05)
1. Solve: $\sqrt{1-y^2} dx = (\sin^{-1} y - x) dy$.
 2. Solve: $\frac{dy}{dx} + y \cot x = 4x \operatorname{cosec} x$.
- Q.3(A) Answer in short. (04)
1. State general form of Bernoulli's differential equation.
 2. Find the integrating factor of $\frac{dy}{dx} = x + y$.
 3. Determine whether the differential eq. $y dx + (y+x) dy = 0$ is exact or not.
 4. Solve: $y = px + \sin^{-1} p$.
- Q.3(B) Answer any one out of two. (02)
1. Solve $x \frac{dy}{dx} + y = x^3 y^6$.
 2. Find the integrating factor of $x \frac{dy}{dx} + y = x^3 y^3$.
- Q.3(C) Answer any one out of two. (03)
1. Solve: $x \frac{dy}{dx} - y = y^2 \log x$.
 2. Solve $(x^2 - ay) dx + (y^2 - ax) dy = 0$.

- Q.3(D) Answer any one out of two. (05)
1. Show that $(x^2-2xy^2+y^4)dx-(2x^2y-4xy^3+\sin y)dy=0$ is exact, hence find its solution.
 2. Solve $\sin y \frac{dy}{dx} + x \cos y = x$.
- Q.4(A) Answer in short. (04)
1. Solve $(D^2-3D-4)y=0$.
 2. Solve $(D^2-6D+9)y=0$.
 3. Find $\frac{1}{D^2-7D+12} e^{5x}$
 4. Find $\frac{1}{(D-2)^3} e^{2x}$
- Q.4(B) Answer any one out of two. (02)
1. Find only P.I. for $(D^2-1)y=\sin 5x$
 2. Solve $(D^2+D+1)y=0$
- Q.4(C) Answer any one out of two. (03)
1. Find $\frac{1}{(D+2)^2} x^2$.
 2. Solve $(D^3-7D-6)y=0$.
- Q.4(D) Answer any one out of two. (05)
1. Solve $(D^3-4D^2+5D-2)y=7e^x$.
 2. Solve $(D^3-4D+3)y=\cos 2x \cdot \sin 3x$
- Q.5(A) Answer in short. (04)
1. Solve $(x^2D^2-xD-3)y=0$
 2. Solve $(x^2D^2-2xD+2)y=0$
 3. Find C.F. of $(x^2D^2+xD-1)y=x^2 e^x$
 4. Solve $(x^2D^2+xD)y=0$
- Q.5(B) Answer any one out of two (02)
1. Find only P.I. for $(x^2D^2-xD+1)y=2\log x$
 2. Find only P.I. for $(x^2D^2-2xD+2)y=x^3$
- Q.5(C) Answer any one out of two (03)
1. Solve: $(x^2D^2-2xD-4)y=x^4$
 2. Solve: $(xD^3-D^2)y=1/x$.
- Q.5(D) Answer any one out of two. (05)
1. Solve: $(x^3D^3+3x^2D^2-6xD+6)y=(x^2-\frac{1}{x^2})^2$
 2. Solve: $(x^2D^2+1)y=3x^2$.
