

B.Sc. Semester - 1 (CBCS) Examination
Nov/Dec - 2022 (NEW COURSE)
MATHEMATICS (CORE)

Time: 2:30 Hours

Marks: 70

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate marks.

Q-1 (A) Answer any two out of three.**[10]**

- (1) For $x > 0$, show that $\frac{x}{1+x^2} < \tan^{-1}x < x$.
- (2) Expand $\cos x$ in ascending powers of x .
- (3) In usual notation prove that $\sin(e^x - 1) = x + \frac{x^2}{2} - \frac{5x^4}{24} + \dots$

Q-1 (B) Answer any one out of two**[04]**

- (1) Find coefficient of x^4 in expansion of $\log(\cos x)$.
- (2) State and prove Alternative form of Cauchy's mean value theorem.

Q-2 (A) Answer any two out of three.**[10]**

- (1) State general form of linear differential equation, also derive formula to find its solution.
- (2) Solve: $(x^2 + y^2) dx + 2xy dy = 0$.
- (3) Solve: $x^2 \frac{dy}{dx} = 3x^2 - 2xy + 1$.

Q-2 (B) Answer any one out of two**[04]**

- (1) Evaluate $\lim_{x \rightarrow \pi/2} (\sin x)^{\tan x}$.
- (2) Evaluate $\lim_{x \rightarrow 0} \frac{\cos x - 1 + \frac{x^2}{2}}{x^4}$

Q-3 (A) Answer any two out of three.**[10]**

- (1) Solve $y = 2px + y^2 p^3$.
- (2) Show that $(x^2 - 2xy^2 + y^4)dx - (2x^2y - 4xy^3 + \sin y)dy = 0$ is exact, hence find its solution.
- (3) Solve $x \frac{dy}{dx} = y - \sqrt{y}$ differential equation.

Q-3 (B) Answer any one out of two**[04]**

- (1) Give general form of Clairaut's differential equation, also find its solution.
- (2) Solve: $x \frac{dy}{dx} - y = y^2 \log x$.

Q-4 (A) Answer any two out of three.**[10]**

- (1) In usual notation prove that $\frac{1}{f(D)} e^{ax} = \frac{1}{f(a)} e^{ax}$ if $f(a) \neq 0$.
- (2) Solve $(D^3 - 12D^2 + 6D - 8)y = e^{2x}$.
- (3) Solve $(D^2 - 4D + 3)y = \cos 2x \sin 3x$

Q-4 (B) Answer any one out of two**[04]**

- (1) Solve $(D^2 - 7D + 12)y = e^{5x}$
- (2) Find $\frac{1}{(D-1)^2} x^2$.

Q-5 (A) Answer any two out of three.**[10]**

- (1) Solve: $(x^2 D^2 - 2xD + 2)y = x^3$.
- (2) Solve: $(x^3 D^3 + 2x^2 D^2 + 2)y = 10(x + \frac{1}{x})$.
- (3) Solve: $(x^2 D^2 - 2)y = x^2 + \frac{1}{x}$.

Q-5 (B) Answer any one out of two**[04]**

- (1) Solve: $(x^2 D^2 - 2xD - 4)y = x^4$
- (2) Solve: $(xD^3 - D^2)y = 1/x$.
