

B.Sc. Semester - 1 (CBCS) Examination
Oct/Nov-2024 (As Per Syllabus Year June-2018)
MATHEMATICS (CORE)

Time: 2:30 Hours

Marks: 70

Instructions:

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

Que.1(A) Answer any one of the following questions. (07)

- 1) State and prove Lagrange's mean value theorem.
- 2) For $x > 0$ show that $\frac{x}{1+x^2} < \tan^{-1} x < x$

Que.1(B) Answer any one of the following questions. (04)

- 1) Obtain expansion of $\log x$ in ascending power of $(x-1)$
- 2) Give geometrical interpretation of Roll's theorem.

Que.1(C) Answer any three out of following five questions. (03)

- 1) $\text{glb}(2,3) = \underline{\hspace{2cm}}$
- 2) Write formula for Cauchy's theorem.
- 3) Taylor's theorem for expansion of function is generalized form of
 $\underline{\hspace{2cm}}$
- 4) 4th term of expansion of e^x in terms of x is $\underline{\hspace{2cm}}$
- 5) Expansion of $\cos x = \underline{\hspace{2cm}}$

Que.2(A) Answer any one of the following questions. (07)

- 1) If $\lim_{x \rightarrow \frac{\pi}{2}} \frac{\cos^2 x}{a-b \operatorname{cosec} x} = 1$ then find value of a and b .
- 2) Solve differential equation $(x^2 + y^2) dx - 2xy dy = 0$

Que.2(B) Answer any one of the following questions. (04)

- 1) Solve differential equation $y dx + (y-x) dy = 0$
- 2) Find $\lim_{x \rightarrow 1} \frac{\log x}{x-1}$

Que.2(C) Answer any three out of following five questions. (03)

- 1) To evaluate indeterminate forms we use $\underline{\hspace{2cm}}$
- 2) Define order and degree of differential equation.
- 3) Write form of Bernoulli's differential equation.
- 4) Integrating factor of differential equation $\frac{dy}{dx} = x + y$ is $\underline{\hspace{2cm}}$.
- 5) $\lim_{x \rightarrow 0} \frac{\tan x}{x}$ is of the form $\underline{\hspace{2cm}}$.

Que.3(A) Answer any one of the following questions. (07)

- 1) Solve the differential equation $y = p \sin p + \cos p$.
- 2) Solve the differential equation $y = 2px + y^2 p^3$.

Que.3(B) Answer any one of the following questions. (04)

- 1) Solve the differential equation $(6D^2 - D - 2)y = 0$.
- 2) Solve the differential equation $\frac{d^2 y}{dx^2} + \frac{dy}{dx} + y = 0$

Que.3(C) Answer any three out of following five questions. (03)

- 1) Write form of Clairaut 's differential equation.
- 2) What is auxiliary equation?
- 3) What is C.F. and P.I.?
- 4) The operator D means_____
- 5) The general solution of $px - y = e^p$ is_____

Que.4(A) Answer any one of the following questions. (07)

- 1) $(D^3 + 2D^2 + D) y = e^{2x}$.
- 2) $(D^4 - 3D^2 + 2) y = \sin 4x$.

Que.4(B) Answer any one of the following questions. (04)

- 1) Find $\frac{1}{D^3} (5x^2)$
- 2) $\frac{1}{D-3} \sin 2x$

Que.4(C) Answer any three out of following five questions. (03)

- 1) If $m_1 = m_2$ are two equal roots of the equation $f(D) = 0$ then C.F. is _____
- 2) If $f(D)y = x$ is given linear differential equation then general solution is_____
- 3) $\frac{1}{D} x^2 =$ _____
- 4) $(1 - D)^{-1} =$ _____
- 5) $(1 + D)^{-1} =$ _____

Que.5(A) Answer any one of the following questions. (07)

- 1) Solve $x^2 \frac{d^2 y}{dx^2} + 7x \frac{dy}{dx} + 5y = x^5$
- 2) Explain a method to find particular solution of homogeneous linear differential equation with variable co efficient.

Que.5(B) Answer any one of the following questions. (04)

- 1) Solve : $\frac{d^2 y}{dx^2} = \frac{6y}{x^2}$
- 2) In standard notation prove that $\frac{1}{f(\theta)} x^m = \frac{1}{f(m)} x^m$

Que.5(C) Answer any one of the following questions. (03)

- 1) Find general form of homogeneous linear differential equation.
- 2) Find auxiliary equation of $x^2 \frac{d^2 y}{dx^2} - x \frac{dy}{dx} + y = x^3$
- 3) Find C.F. of $x^2 \frac{d^2 y}{dx^2} + 3x \frac{dy}{dx} + y = \frac{2}{x-1}$
- 4) Evaluate $\frac{1}{\theta^2 + \theta - 2} (x^2)$
- 5) Define: Integrating factor.
