

B.Sc. Semester - 1 (CBCS) Examination
Feb/Mar. -2021 (NEW 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 any two out of three. (10)

1. In usual notations prove that $e^x \cdot \cos x = 1 + x - \frac{x^3}{3} - \frac{x^4}{6} - \frac{x^5}{5} - \dots$
2. Expand $e^{\sin^{-1} x}$ upto first four terms in ascending power of x .
3. For $x > 0$, show that $\frac{x}{1+x^2} < \tan^{-1} x < x$.

Q.1(B) Answer any one out of two. (04)

1. Obtain expansion of $\cos x$ in ascending power of x .
2. Verify Lagrange's mean value theorem for $f(x) = (x-1)(x-2)(x-3)$ in $[1, 4]$.

Q.2(A) Answer any two out of three. (10)

1. Solve: $\sqrt{1-y^2} dx = (\sin^{-1} y - x) dy$.
2. Solve: $\frac{dy}{dx} + y \cot x = 4x \operatorname{cosec} x$.
3. Solve: $(x^2 + y^2) dx + 2xy dy = 0$.

Q.2(B) Answer any one out of two. (04)

1. Evaluate: $\lim_{x \rightarrow \pi/2} (\sin x)^{\tan x}$.
2. If $\lim_{x \rightarrow \pi/2} \frac{\cos^2 x}{a - b \operatorname{cosec} x} = 1$, then find values of a and b .

Q.3(A) Answer any two out of three. (10)

1. Solve $y = 2px + y^2 p^3$.
2. Solve $y = (1+p)x + p^2$.
3. Solve $x p^2 - y p - y = 0$.

Q.3(B) Answer any one out of two. (04)

1. Solve $p^2 - (x+3y)p + 2y(x+y) = 0$.
2. Give general form of Clairaut's differential equation, also find it's solution.

Q.4(A) Answer any two out of three. (10)

1. Solve $(D^3 - 4D^2 + 5D - 2)y = 7e^x$.
2. Solve $(D^2 - 4D + 3)y = \cos 2x \cdot \sin 3x$
3. In usual notations prove that $\frac{1}{f(D)} e^{ax} = \frac{1}{f(a)} e^{ax}$ if $f(a) \neq 0$.

Q.4(B) Answer any one out of two. (04)

1. Find $\frac{1}{(D+2)^2} x^2$.
2. Find $\frac{1}{D^2 + D} x^2 + 2x + 4$.

Q.5(A) Answer any two out of three. (10)

1. Solve: $(x^3 D^3 + 3x^2 D^2 - 6x D + 6)y = (x^2 - \frac{1}{x^2})^2$
2. Solve: $(x^2 D^2 + 1)y = 3x^2$.
3. Solve: $(x^3 D^3 + 2x^2 D^2 + 2)y = 10(x + \frac{1}{x})$.

Q.5(B) Answer any one out of two. (04)

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