

2ND SEM. / COMMON. / 2023(S) OLD

BST-201 ENGINEERING MATHEMATICS - II

Full Marks: 80

Time- 3 Hrs

Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks

1. Answer **All** questions 2 x 10

- a. Find the derivative of \sqrt{x} with respect to x^2
- b. Find the image of the point $(2, -3, 1)$ with respect to ZX- plane
- c. Integrate $\int \sqrt{1 - \cos 2x} dx$
- d. Find centre and radius of sphere
 $2x^2 + 2y^2 + 2z^2 - 4x + y - 3z - 1 = 0$
- e. Evaluate $\lim_{x \rightarrow 0} \frac{\sin^{-1} x}{x}$
- f. Evaluate $\int_{-2}^2 |x| dx$
- g. Determine Order and Degree of the differential equation
$$\frac{d^3 y}{dx^3} = \left\{ 1 + \frac{dy}{dx} \right\}^{\frac{5}{3}}$$
- h. Integrate $\int e^x \{ \cot x + \ln \sin x \} dx$
- i. If $f(x, y) = \ln(xy)$, then find $\frac{\partial f}{\partial x}$ and $\frac{\partial f}{\partial y}$
- j. Solve $dy + (1 + y^2)dx = 0$

2. Answer **Any Six** Questions 5 x 6

- a. Prove that $\lim_{x \rightarrow 0} \left(\frac{a^x - 1}{x} \right) = \log_e a$
- b. Integrate $\int x^2 e^x dx$
- c. Find the extremum points and extremum value of the function
 $f(x) = x^3 - 6x^2 + 9x + 7$
- d. Find angle between the plane $x + 2y + 2z - 7 = 0$ and
 $2x - y + z + 8 = 0$
- e. Differentiate $(\log x)^{\tan x}$
- f. Solve $(x^2 - 1) \frac{dy}{dx} + 2xy = 1$
- g. Evaluate $\int_0^{\frac{\pi}{2}} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}} dx$

- 3 a) Test the continuity of function $f(x) = \begin{cases} (1 + 2x)^{\frac{1}{x}} & \text{if } x \neq 0 \\ e^2 & \text{if } x = 0 \end{cases}$ at $x = 0$ 5
- b) Find the ratio in which the line joining the points $(1,3,1)$ and $(2,6,-2)$ is divided by YZ-plane 5
- 4 a) Integrate $\int \frac{dx}{x\sqrt{25-(\log x)^2}}$ 5
- b) Find $\frac{dy}{dx}$ if $y^2 \cot x = x^2 \cot y$ 5
- 5 a) Solve $\frac{dy}{dz} = \frac{\sqrt{1-y^2}}{\sqrt{1-z^2}}$ 5
- b) Integrate $\int \frac{\sin x}{\sin(x+\alpha)} dx$ 5
- 6 a) Differentiate $\sqrt{\sin \sqrt{x}}$ 5
- b) Integrate $\int \tan^4 \theta d\theta$ 5
- 7 a) If $z = \tan^{-1} \left\{ \frac{x^3+y^3}{x+y} \right\}$, then Prove that $x \frac{\partial z}{\partial x} + y \frac{\partial z}{\partial y} = \sin 2z$ 5
- b) Evaluate $\lim_{x \rightarrow 1} \frac{\log_e(2x-1)}{x-1}$ 5