

B.C.S. GOVT P.G. COLLEGE, DHAMTARI (C.G.)

ASSIGNMENT -2019-20

B.Sc. II Year (REGULAR)

MATHEMATICS

PAPER SECOND

(DIFFERENTIAL EQUATIONS)

DATE: 05-10-2020

M.M.: 50

Note: Answer any five questions. Each question carries equal marks.

1.a) Define Bessel functions.

[4 + 6 = 10]

b) Show that Legendre polynomial can be expressed in the form

$$P_n(x) = \frac{1}{2^n n!} \frac{d^n y}{dx^n} (x^2 - 1)^n.$$

2. a) Define Laplace Transform.

[4 + 6 = 10]

b) Show that $L^{-1} \left\{ \frac{1}{p} \right\} = 1 - \frac{t^2}{(1 \cdot 2)^2} + \frac{t^4}{(1 \cdot 4)^2} - \frac{t^6}{(1 \cdot 6)^2} \dots \dots \dots \infty.$

3. a) Solve $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} - 6 \frac{\partial^2 z}{\partial x \partial y} = y \cos x.$

[4 + 6 = 10]

b) Solve : $(m^2 - n^2)p + (n^2 - l^2)q = l^2 - m^2.$

4. a) Solve : $(D^2 - DD' + D' - 1)z = x^2 y.$

[4 + 6 = 10]

b) Solve $(4x^2 - 4x D' + D'^2)z = 1$ in $(x + 2).$

5. a) Define functional with an example.

[4 + 6 = 10]

b) Find the shortest distance between the curves $y = x$ and $y = x^2$ in the interval $[0, 1].$

6. a) Prove that $2J'_n(x) = J_{n-1}(x) - J_{n+1}(x).$

[4 + 6 = 10]

b) Solve : $(D^2 + 9)y = \cos 2x$ if $y(0) = 1, y\left(\frac{\pi}{2}\right) = -1.$