

2E2401

Roll No.

2E2401

B. Tech. II - Sem. (Main) Exam., May - 2019

BSC

2FY2 – 01 Engineering Mathematics - II

Time: 3 Hours

Maximum Marks: 160

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and four questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

*Use of following supporting material is permitted during examination.
(Mentioned in form No. 205)*

1. NIL2. NIL**PART – A****(Answer should be given up to 25 words only)****[10×3=30]****All questions are compulsory**

Q.1 State the rank – nullity theorem.

Q.2 Determine whether the set $\{(3, 2, 4), (1, 0, 2), (1, -1, -1)\}$ of vectors is linearly independent.

Q.3 Write the Bernoulli's equation.

Q.4 Write the Clairaut's equation.

Q.5 Write the Euler – Cauchy equation.

Q.6 If the roots of A.E. are $100 \pm \sqrt{500}$ then C.F. isQ.7 What is the order and degree of the ODE $\frac{d^4y}{dx^4} = \cos\left(\frac{d^3y}{dx^3}\right)$?

[2E2401]

Page 1 of 3

[8220]

Q.8 When is a nonlinear PDE semilinear?

Q.9 What is the homogeneous PDE?

Q.10 Classify the following PDE as to type in the second quadrant of the xy – plane

$$\sqrt{x^2+y^2} u_{xx} + 2(x-y)u_{xy} + \sqrt{x^2+y^2} u_{yy}$$

PART – B

(Analytical/Problem solving questions)

[5×10=50]

Attempt any five questions

Q.1 Find the rank of the following matrix by reducing it to the normal form:

$$A = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 2 & 1 & 4 & 5 \\ 1 & 5 & 5 & 7 \\ 8 & 1 & 14 & 17 \end{pmatrix}$$

Q.2 Solve the differential equation –

$$(3x^2y^3e^y + y^3 + y^2)dx + (x^3y^3e^y - xy)dy = 0$$

Q.3 Solve: $p^2 + 2py \cot x = y^2$, where $p = \frac{dy}{dx}$.

Q.4 Solve: $(D^3+1)y = (e^x + 1)^2$, where $D \equiv \frac{d}{dx}$.

Q.5 Solve: $D^2x + m^2y = 0$; $D^2y - m^2x = 0$, where $D \equiv \frac{d}{dt}$.

Q.6 Find the general solution of the partial differential equation-

$$xy^2p + y^3q = (zxy^2 - 4x^3)$$

Q.7 Solve: $z^2(p^2 + q^2) = x^2 + y^2$

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions)

[4×20=80]

Attempt any four questions

Q.1 Examine whether the following matrix A is diagonalizable. If so, obtain the matrix P such that $P^{-1}AP$ is a diagonal matrix.

$$A = \begin{pmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{pmatrix}$$

Q.2 Solve by the method of variation of parameters:

$$x^2 \frac{d^2y}{dx^2} - 2x(1+x) \frac{dy}{dx} + 2(1+x)y = x^3$$

Q.3 Solve in series:

$$x \frac{d^2y}{dx^2} + \frac{dy}{dx} + xy = 0$$

Q.4 Find the complete integral of the partial differential equation:

$$px + qy + z = xq^2$$

Q.5 Use the method of separation of variables to solve the following PDE:

$$\frac{\partial^2 z}{\partial x^2} = \frac{1}{k} \frac{\partial z}{\partial t}, \text{ where } z = z(x, t) \text{ with the conditions } z(0, t) = z(1, t) = 0 \text{ for all } t.$$
