21501

Roll No.

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

BSC

2FY2-01 Engineering Mathematics - II

Time: 3 Hours

Maximum Marks: 160

Instructions to Candidates:

Part – A: *Short answer questions (up to 25 words) 10 ×3 marks = 30 marks. All ten questions are compulsory.*

Part – B: *Analytical/Problem solving questions 5 ×10 marks = 50 marks. Candidates have to answer five questions out of seven.*

Part – C: *Descriptive/Analytical/Problem Solving questions 4 ×20 marks = 80 marks. Candidates have to answer four questions out of five.*

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. NIL

2. NIL

PART - A

Q.1 State rank nullity theorem. [3]

Q.2 Determine a, b and c so that A is orthogonal matrix, where – [3]

$$A = \begin{bmatrix} 0 & 2b & c \\ a & b & -c \\ a & -b & c \end{bmatrix}$$

Q.3 Find the integrating factor (I.F.) of differential equation – [3]

$$(x + 2y^3)\, dy = y\, dx$$

Q.4 Write the Clairaut's form of differential equation and solve – [3]

$$\sin px \cos y = \cos px \sin y + p$$

Q.5 Find the solution of differential equation – [3]

$$\frac{d^4y}{dx^4} + y = 0$$

Q.6 Write the Legendre and Bessel differential equations. [3]

Q.7 Form the partial differential equation by elimination of constants a and b from the equation $z = ax + a^2y^2 + b$ [3]

Q.8 Solve the partial differential equation – [3]

$$y - p = (x - q^2)$$

Q.9 Classify the second order partial differential equation – [3]

$$4\frac{\partial^2 u}{\partial x^2} - 16\frac{\partial^2 u}{\partial x\, \partial y} + 9\frac{\partial^2 u}{\partial y^2} = 0$$

Q.10 Write the one dimensional heat and wave equations. [3]

PART – B

Q.1 Reduce the matrix – [10]

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

in its normal form and hence find its rank.

Q.2 Verify Cayley – Hamilton theorem for the matrix – [10]

$$A = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$$

Hence, find A^{-1}.

Q.3 Solve: $y = 3px + 6p^2y^2$, where $p = dy/dx$ [10]

Q.4 Solve : $\frac{dx}{dt} - 7x + y = 0$, [10]

$$\frac{dy}{dt} - 2x - 5y = 0$$

Q.5 Solve the differential equation by changing the independent variable – [10]

$$\cos x \frac{d^2y}{dx^2} + \sin x \frac{dy}{dx} - 2y \cos^3 x = 2 \cos^5 x$$

Q.6 Solve the differential equation using Lagrange method – [10]

$$(y^2 + z^2 - x^2)\, p - 2xyq + 2xz = 0$$

Q.7 Solve $\frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial y} + 2u$

by method of separation of variables.

PART – C

Q.1 Find the Eigen values and Eigen vectors of the matrix $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ [20]

Also, find the matrix which transforms the matrix A to a diagonal form.

Q.2 Solve the differential equation – [20]

$$(3x + 2y^2)\, y\, dx + 2x\,(2x + 3y^2)\, dy = 0$$

Q.3 Solve : $x^2 \frac{d^2y}{dx^2} + x\frac{dy}{dx} - y = x^2 e^x$ by the method of Variation of parameters. [20]

Q.4 Find the complete integral of $(p^2 + q^2)\, y = qz$ using Charpit's method. [20]

Q.5 Find the solution of one – dimensional wave equation by method of separation of variables. [20]
