



ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

Mid-Semester Examination

Winter Semester, A. Y. 2022-2023

Course No.: Math 4123

Time: 90 Minutes

Course Title: Matrix and Differential Equations

Full Marks: 75

There are 3 (three) questions. Answer all 3 (three) questions. The symbols have their usual meanings. Programmable calculators are not allowed. Marks of each question and corresponding COs and POs are written in the brackets.

- 1(a) Define symmetric and skew-symmetric matrix. Find the symmetric and skew-symmetric parts of the matrix AB , where
- $$A = \begin{bmatrix} 1 & 2 & 1 \\ 2 & 1 & 2 \\ 3 & 2 & 1 \end{bmatrix} \text{ and } B = \begin{bmatrix} 2 & 2 & 0 \\ 2 & 4 & 2 \\ 4 & 2 & 2 \end{bmatrix}$$
- 10
(CO1, PO1)
- (b) Using elementary row transformations, to reduce A to I find inverse of A , where
- $$A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 3 & 4 & 5 \\ 3 & 4 & 5 & 7 \\ 4 & 5 & 5 & 7 \end{bmatrix}$$
- 15
(CO1, PO2)
- 2(a) Solve the following system of linear equations
- $$\begin{aligned} 3x_1 - 2x_2 + 2x_3 &= 2 \\ 2x_1 + 2x_2 - x_3 &= 7 \\ 4x_1 - 4x_2 + 3x_3 &= 1 \\ 2x_1 - x_2 - 3x_3 &= 6. \end{aligned}$$
- 12
(CO1, PO1, PO2)
- (b) Solve the differential equations
- $$(x^3y + xy)dy - (1 + x + x^2 + y^2 + xy^2 + x^2y^2)dx = 0.$$
- 7
(CO3, PO1, PO2)
- (c) Solve: $(ye^{xy} \cos 2x - 2e^{xy} \sin 2x + 2x)dx + (xe^{xy} \cos 2x - 3)dy = 0$.
- 6
(CO3, PO1, PO2)
- 3(a) Solve: $\frac{dy}{dx} + \frac{y}{(1-x^2)^2} = \frac{x+\sqrt{1-x^2}}{(1-x^2)^2}$.
- 8
(CO3, PO1, PO2)
- (b) Solve $\sec y (1-x^2) \frac{dy}{dx} + x \sin y = x \cos y$.
- 8
(CO4, PO1, PO2)
- (c) An inductance of 0.2 henries and a resistance of 2 ohms are connected in a series with an e.m.f. E volts. If the current is zero when $t = 0$, find the current at end of 0.01 sec if $E = 10$ volts.
- 9
(CO4, PO1, PO2)