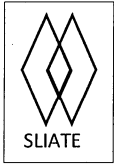


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SLIATE

SRI LANKA INSTITUTE OF ADVANCED TECH

CAL EDUCATION

(Established in the Ministry of Higher Education, vide in Act No. 29 of 1995)

Higher National Diploma in Engineering (Civil/Electrical/Mechanical/Building Services)

First Year, Second Semester Examination – 2016

MA 1202/BSE 1201 – Applied Engineering Mathematics

Instructions for Candidates:Answer any **four (4)** questions.

All questions carry equal marks.

No. of questions: 5

No. of pages : 4

Time : Two (2) hours

1. a) If

$$a = 3i - k$$

$$b = -3i + 7j + 2k$$

$$c = i + 5j + 4k$$

Find i. $a \cdot c$

[2 marks]

ii. $a \times b$

[2 marks]

iii. $c \cdot (a \times b)$

[3 marks]

b) Find the constant λ such that the following three vectors are coplanar.

$$X = 2i - j + k$$

$$Y = i + 2j - 3k$$

$$Z = 3i + \lambda j + 5k$$

[5 marks]

c) If $A = x^2y + y^2x + yz^2 - 7$

$$B = xy^2i + zy^2j + xz^2k$$

Find i. Div A at point (1, 2, 3)

[4 marks]

ii. Curl B

[3 marks]

d) A particle moves along the curve $x = t^3 + 1$, $y = t^2$ and $z = 2t + 5$ where t is the time. Find the components of its velocity and acceleration at time $t = 1$ in the direction of $2i + 3j - 4k$.

[6 marks]

2. a) Find differential equation of $y = ae^{3x} + be^x$.

[5 marks]

b) Find the solution for following differential equations.

i). $(2xy + x^2)dy = (3y^2 + 2xy)dx$

ii). $\frac{dy}{dx} = \frac{x + 2y - 3}{2x + y - 3}$

[14 marks]

c) Find the general solution for following linear differential equation.

$$\frac{dy}{dx} + \frac{y}{x} = x^3 - 3$$

[06 marks]

3. Find the particular solution for the following differential equations.

a) $\frac{d^2y}{dx^2} + \frac{dy}{dx} - 30y = 0$

[05 marks]

b) $(D^2 + 2D + 2)y = 0$, boundary conditions are given as $y(0) = 0$ and $y'(0) = 1$.

[06 marks]

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

[07 marks]

d) $\frac{d^2y}{dx^2} + 6\frac{dy}{dx} + 9y = e^{-3x}x^{-3}$

[07 marks]

4. a) Find the smallest positive root of $x^2 - x - 10 = 0$, correct to three decimal places using Newtons- Raphson method.

[09 marks]

b) Find the solutions of the following equations by Jacobi's method.

$$5x + 2y + z = 12$$

$$x + 4y + 2z = 15$$

$$x + 2y + 5z = 20$$

[14 marks]

c) For the above set of equations write down the 1st iteration step (only) using Gause Zeidal method.

[02 marks]

“2”

5. a) A problem is given to three students A, B and C whose chances of solving it are 0.5, 0.65 and 0.25 respectively.
Find the probability that the problem will not be solved. [05 marks]

b) The marks of 500 candidates in Mathematics subject are normally distributed about a mean value of 45 marks and a standard deviation of 20 marks.

i). How many students score between 50 and 70 marks?

ii). How many students score above 80 marks?

iii). How many students score above 38 marks?

iv). Find the value of marks X if 15% of candidates obtain a distinction by scoring X marks or more.

[20 marks]