

Final Assessment Test - November 2019

Course: MAT2002 - Applications of Differential and Difference Equations

Class NBR(s): 0391 / 0392 / 0393 / 0394 / 0395 / 7204

Slot: B1+TB1

Max. Marks: 100

ON TELESTING MOBILE PHONE/SMART WATCH, EVEN IN 'OFF' POSITION, IS EXAM MALPRACTICE

Answer any FIVE Questions SCARCH VIT QUESTION PAPERS (5 X 20 = 100 Marks)

ON TELEGIRAL TO JOIN

Find the Fourier series expansion of the function $f(x) = \begin{cases} \pi x, & 0 \le x \le 1 \\ \pi(2-x), & 1 \le x \le 2 \end{cases}$, f(x+2) = f(x) and [10]

hence find the value of the series $\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{\epsilon^2} + \dots$

The turning moment M units of a crank shaft of a steam engine are given for a series of values of the [10] crank angle heta . Obtain the first three terms of sine series to represent M. Also verify the value M from the obtained function at $\theta = 60^{\circ}$.

30° 60° 120° 150° 7850 5499 2656

i) If one of the eigen values of $A = \begin{bmatrix} 7 & 4 & -4 \\ 4 & -8 & -1 \\ 4 & -1 & -8 \end{bmatrix}$ is -9. Find the other two eigen values.

Werify the Cayley-Hamilton theorem for $A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$. Hence find the value of the matrix given by

[7]

Reduce the quadratic form $4x_1^2 + 4x_2^2 + x_3^2 - 2x_1x_2$ into canonical form by orthogonal transformation. [10]

Also find the nature, rank, index and signature of the quadratic form.

b) Solve: $(x^2D^2 - 2xD - 4)y = x^2 + 2\log x$.

Obtain the general solution of the differential equation given by $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + 4y = e^{-2x}\frac{4y}{\cos 3x}.$ [10] Solve: $(x^2D^2 - 2xD - 4)y = x^2 + 2\log x$. [10] Solve the differential equation $y''' - 3y'' + 3y' - y = t^2e'$ given that y(0) = 1, y'(0) = 0 and y''(0) = -2 using the Laplace transform.

Find the general solution to $x_1' = -x_1 - 2x_2 + 3$ subject to the conditions $x_1(0) = -4$, $x_2(0) = 5$. [10]

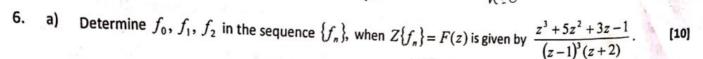
Examine whether the two-point BVP given by $u'' + \lambda u = 0$, u'(0) = 0, u'(L) = 0 represents a Sturm-[10] Liouville problem. If so, find the eigen values and the eigen functions of that problem.

Find the power series solution of $x^2y'' + (x^2 - x)y' + y = 0$ about x = 0. [10]



a" + (6-a) in + e = 0





b) Find the inverse Z -transform of [5+5] 10z = (z-1)(z-2) using the method of partial fraction.

$$\underbrace{\overline{(z+a)^2}}^{z^2} \text{ using convolution theorem.}$$

- 7. a) Solve the difference equation $x_{t+2} 5x_{t+1} + 6x_t = 4^t + t^2 + 3$ by the method of undetermined co-efficients. [10]
 - b) Solve the difference equation $y_{n+2} + 6y_{n+1} + 9y_n = 2^n$, y(0) = y(1) = 0 using the Z -transform. [10]



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