Printed Pages – 7 Roll No. : ....

B000311(014)

B.Tech. (Third Semester) Examination

Nov.-Dec. 2020

(AIC Scheme)

MATHEMATICS-III

Time Allowed : Three hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : *Attempt all questions. Part (a) is compulsory & Solve any **two** parts from (b), (c) and (d) of each questions.*

Unit-I

1. (a) (i) Write the condition for existance of Laplace transform. 2

(ii) If $f(t)$ is a periodic function with period T then what is $Lf(t)$. 2

(b) Find the inverse Laplace Transform of : 8

(i) $\frac{s^2+6}{(s^2+1)(s^2+4)}$

(ii) By convolution theorem solve

$$L^{-1}\frac{s}{(s^2+1)(s^2+4)}$$

(c) Find the Laplace Transform of $\frac{1-\cos t}{t^2}$. 8

(d) Solve the differential equation by transform method.

$\frac{d^2x}{dt^2}+9x=\cos 2t$, if $x(0)=1,\ x(\pi/2)=-1$. 8

Or

Solve the differential equation by transform method

$ty''+2y'+ty=\sin t$, when $y(0)=1$.

Unit-II

2. (a) Solve : 4

$$\frac{\partial^3 z}{\partial x^2 \partial y}+18xy^2+\sin(2x-y)=0$$

(b) Solve : 8

$$(x^2-yz)p+(y^2-zx)q=(z^2-xy)$$

Or

Solve :

$$(D^2+2DD'+D'^2-2D-2D')z=\sin(x+2y)$$

(c) Solve : 8

$$(D^2+DD'-6D'^2)z=\cos(2x+y)$$

(d) Solve by the method of separation of variables

$4\frac{\partial u}{\partial x}+\frac{\partial u}{\partial y}=3u$, given $u=3e^{-y}-e^{-5y}$ when $x=0$. 8

Unit-III

3. (a) (i) Write applications of Poisson distribution. 2

(ii) Define Moment generating function of discrete & continuous probability distribution. 2

(b) The probability density $p(x)$ of a continuous random variable is given by $P(x) = y_0 e^{-|x|}$, $-\infty < x < \infty$ find the value of y_0, mean & variance of the distribution. 8

Or

Out of 800 families with 5 children each, how many would you expact to have :

(i) 3 boys

(ii) 5 girls

(iii) Either 2 or 3 boys

(c) In a test on 2000 electric bulbs, it was found that the life of a particular make, was normally distributed with an average life of 2040 hours and S.D. of 60 hours. Estimate the number of bulbs likely to burn for : 8

(i) More than 2150 hours

(ii) Less than 1950 hours

(iii) More than 1920 hours but less than 2160 hours

(d) Fit a Poisson distribution to the set of observation : 8

X	0	1	2	3	4
$F(X)$	122	60	15	2	1

Unit-IV

4. (a) Using Lagrange's formula, evaluate $f(9)$, given 4

x	5	7	11	13	17
$f(x)$	150	392	1452	2366	5202

(b) Using Newton's divided difference formula, evaluate $f(9)$ & $f(15)$:

x	4	5	7	10	11	13
$f(x)$	48	100	294	900	1210	2028

Or

Given sin 45° = 0·7071, sin 50° = 0·7660, sin 55° = 0·8192, sin 60° = 0·8660. Find sin 52° using Newton's forward interpolation formula. 8

(c) Given the following table, find $f(35)$ by using Stirling's & Bessels formula. 8

x	20	30	40	50
$f(x)$	512	439	346	243

(d) Given tan 0° = 0, tan 5° = 0·0875, tan 10° = 0·1763, tan 15° = 0·2679, tan 20° = 0·3640, tan 25° = 0·4663, tan 30° = 0·5774. Using Stirling's formula find the value of tan 16°. 8

Unit-V

5. (a) (i) Write the formula for 4th order Runge-Kutta method. 2

(ii) Adams-Bashforth predictor formula for solving $y' = f(x, y)$ given $y_0 = y(x_0)$. 2

(b) Solve the following differential equation by modified Euler's method $\frac{dy}{dx} = \log(x+y)$, $y(0) = 2$ at $x = 1{\cdot}2$ and $1{\cdot}4$ with $h = 0{\cdot}2$. 8

(c) Using Runge-Kutta method of forth order solve

$$\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2},\quad y(0) = 1 \text{ at } x = 0{\cdot}2 \ \& \ x = 0{\cdot}4$$ 8

Or

Using Adams-Bashforth method to find $y(0{\cdot}4)$, given that $2y' = xy$ and $y(0) = 1$, $y(0{\cdot}1) = 1{\cdot}01$, $y(0{\cdot}2) = 1{\cdot}0097$, $y(0{\cdot}3) = 1{\cdot}023$.

(d) Solve $y' = x + y$, $y(0) = 1$ by Taylor's series method. Hence find the value of y at $x = 0{\cdot}1$ & $x = 0{\cdot}2$. 8