

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 existence of Laplace transform. 2
- (ii) If $f(t)$ is a periodic function with period T then what is $Lf(t)$. 2

B000311(014)**PTO**

- (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

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

Or

Solve the differential equation by transform method

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

Unit-II**B000311(014)**

[3]

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

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

$$x = 0. \quad 8$$

B000311(014)

PTO

[4]

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 randomvariable 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 expect 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

B000311(014)

[5]

(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-IV4. (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 $\sin 45^\circ = 0.7071$, $\sin 50^\circ = 0.7660$, $\sin 55^\circ = 0.8192$, $\sin 60^\circ = 0.8660$. Find $\sin 52^\circ$ using Newton's forward interpolation formula. 8

B000311(014)

PTO

[6]

(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 $\tan 0^\circ = 0$, $\tan 5^\circ = 0.0875$, $\tan 10^\circ = 0.1763$, $\tan 15^\circ = 0.2679$, $\tan 20^\circ = 0.3640$, $\tan 25^\circ = 0.4663$, $\tan 30^\circ = 0.5774$. Using Stirling's formula find the value of $\tan 16^\circ$. 8

Unit-V5. (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 $x = 1.2$ and 1.4 with $h = 0.2$. 8

B000311(014)

[7]

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

$$\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}, \quad y(0) = 1 \text{ at } x = 0.2 \text{ \& } x = 0.4 \quad 8$$

Or

Using Adams-Bashforth method to find $y(0.4)$, given
that $2y' = xy$ and $y(0) = 1, y(0.1) = 1.01, y(0.2)$
 $= 1.0097, y(0.3) = 1.023.$

(d) Solve $y' = x + y, y(0) = 1$ by Taylor's series
method. Hence find the value of y at $x = 0.1$ & $x =$
 $0.2.$ 8