Unit - I 3/7

FkeâeF - I

2. (a) By applying the definition of convergence of a sequence prove that

$\{a_n\}$, where $a_n = \frac{2n-3}{n+1}$,

converges to 2.

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keâeepeS $\{a_n\}$, pene $a_n = \frac{2n-3}{n+1}$, 2 hej DeeYemeeje

nelee n~

(b) Test the convergence of the series :

$$1+\frac{3}{7}x+\frac{3}{7}.\frac{6}{10}x^2+\frac{3}{7}.\frac{6}{10}.\frac{9}{13}x^3+.......$$

ßeCee keâe DeeYemeeejlee keâe hej#eCe keâeepeS :

$$1+\frac{3}{7}x+\frac{3}{7}.\frac{6}{10}x^2+\frac{3}{7}.\frac{6}{10}.\frac{9}{13}x^3+.......$$

3. (a) Define limit point of a sequence. Show that every bounded sequence has a limit point.

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A (Printed Pages 8)

Roll No. ___________

S-674

B.A./B.Sc. (Part-II) Examination, 2015

MATHEMATICS

Second Paper

(Mathematical Methods)

Time Allowed : Three Hours] *[Maximum Marks :* B.A. : 25, B.Sc. : 50

Note : Attempt five questions in all, choosing one question from each unit. Question No. 1 is compulsory.

ØelÙekeâ FkeâeF me Skeâ ØeMve Ûevele nS, keâue heeÙe ØeMvee keâe nue keâeepeS~ ØeMve meKÙee 1 DeeveJeeÙe n~

1. Attempt all parts : 10/20

meYee KeC[nue keâeepeS :

(a) State Leibnitz's theorem for infinite series.

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(b) What is Weierstrass function?

JeeFmšeme Heâueve keÙee n?

(c) Differentiate between extremal and stationary function.

Ûejce Heâueve Deej mleyOe Heâueve keâ Devlej keâe yeleeFÙe~

(d) Test the Convergence of the series :

$$\sum_{n=1}^{\infty} \cos\frac{\pi}{2n}$$

ßeCee keâ DeeYemeeejlee keâe heje#eCe keâeepeS :

$$\sum_{n=1}^{\infty} \cos\frac{\pi}{2n}$$

(e) State Cauchy's integral test for convergence of infinite series.

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(f) Find :

$$L\ \{(t+2)^2\ e^t\}$$

%eele keâeepeS :

$$L\ \{(t+2)^2\ e^t\}$$

(g) Find :

$$L^{-1}\left\{\frac{s+1}{s^2+s+1}\right\}$$

%eele keâeepeS :

$$L^{-1}\left\{\frac{s+1}{s^2+s+1}\right\}$$

(h) Define n^{th} order proximaty of curves.

Je›eâe keâ nJee keâeeš keâe meceehÙe keâe heejYee<ee oeepeS~

(i) Solve :

$$yzp + zxq = xy,$$

where $p=\frac{\partial z}{\partial x},\ q=\frac{\partial z}{\partial y}$

nue keâeepeS :

$$yzp + zxq = xy$$

pene $p=\frac{\partial z}{\partial x},\ q=\frac{\partial z}{\partial y}$

(j) Solve : $(2D^2 - 5DD' + 2D'^2)\ Z=0$

where $D=\frac{\partial}{\partial x},\ D'=\frac{\partial}{\partial y}$

nue keâeepeS : $(2D^2 - 5DD' + 2D'^2)\ Z=0$

pene $D=\frac{\partial}{\partial x},\ D'=\frac{\partial}{\partial y}$

Unit - IV 4/8

FkeâeF - IV

8. (a) Solve $yt - q = xy$

nue keâeepeS :

$$yt - q = xy$$

(b) Solve, using Charpits method :

$$(p^2+q^2)y = qz$$

Ûeejeheš eJeeOe me nue keâeepeS :

$$(p^2+q^2)y = qz$$

9. (a) Solve the following, using Lagrange's equation :

$$(x+2z)p + (uzx - y)q = 2x^2+y$$

ue«eepe meceekeâjCe keâe meneÙelee me evecve keâe nue keâeepeS:

$$(x+2z)p + (uzx - y)q = 2x^2+y$$

(b) Solve, using Monge's method :

$$(r - s)\,x = (t - s)y$$

ceeiepe eJeeOe me nue keâeepeS :

$$(r - s)\,x = (t - s)y$$

ekeâ ØelÙekeâ heejyeæ Deve›eâce Skeâ meecee eyevo jKelee n~

(b) Test the convergence of the series

$$\sum_{n=1}^{\infty} \frac{(2x-1)^n}{\sqrt{n}}$$

ßeCee $\sum_{n=1}^{\infty} \frac{(2x-1)^n}{\sqrt{n}}$ keâe DeeYemeeejlee keâe hejer#eCe keâeepeS~

Unit - II 4/7

FkeâeF - II

4. (a) Evaluate :

$$L\left[e^{-4t}\frac{\sin 3t}{t}\right]$$

%eele keâeepeS :

$$L\left[e^{-4t}\frac{\sin 3t}{t}\right]$$

(b) Find :

$$L^{-1}\left[\frac{(s^2+1)}{(s+1)^2\,(s^2+4)}\right]$$

%eele keâeepeS :

$$L^{-1}\left[\frac{(s^2+1)}{(s+1)^2\,(s^2+4)}\right]$$

 P.T.O.

5. (a) Using method of Laplace transform, solve the differential Equation

$$y''+y=e^{t}+2,\ y(0)=0,\ y'(0)=0$$

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$$y''+y=e^{t}+2,\ y(0)=0,\ y'(0)=0$$

(b) Evaluate the following with the help of convolution theorem.

$$L^{-1}\left[\frac{s}{(s^2+a^2)^2}\right]$$

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$$L^{-1}\left[\frac{s}{(s^2+a^2)^2}\right]$$

Unit - III 4/8

FkeâeF - III

6. (a) Find the stationary function of :

$$\int_0^4 [xy'-y'^2]\,dx$$

Which is determined by the boundary conditions y(0) = 0 and y(4) = 1

Heâueveekeâ $\int_0^4 [xy'-y'^2]\,dx$

keâe DeÛeue Heâueve %eele keâeepeS, pee ekeâ heejmeecee ØeeleyevOe y(0) = 0 Deej y(4) = 1 me eveOeeejle nelee n~

(b) Show that the shortest curve between any two points on a cylinder is a helix.

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7. (a) Determine the Euler-Ostrogradsky Equation for the functional

$$I[u(x,y,z)]=\iiint_D\left[\left(\frac{\partial u}{\partial x}\right)^2+\left(\frac{\partial u}{\partial y}\right)^2+\left(\frac{\partial u}{\partial z}\right)^2\right]dx\,dy\,dz$$

given that the values of u are prescribed on the boundary C of the domain D.

Heâueveekeâ

$$I[u(x,y,z)]=\iiint_D\left[\left(\frac{\partial u}{\partial x}\right)^2+\left(\frac{\partial u}{\partial y}\right)^2+\left(\frac{\partial u}{\partial z}\right)^2\right]dx\,dy\,dz$$

keâ eueS DeeÙeuej-DeemšesÇe[mkeâe meceekeâjCe %eele keâeepeS peyeekeâ heejmeecee C keâ #e$e D hej u keâ ceeve n~

(b) State and prove principle of Invariance of Euler's Equation.

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