

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)
BSc DEGREE EXAMINATION MAY 2017
(First Semester)

Branch - MATHEMATICS WITH COMPUTER APPLICATIONS

DIFFERENTIAL EQUATIONS LAPLACE TRANSFORMS &
FOURIER SERIES

Time : Three Hours

Maximum : 75 Marks

SECTION-A (20 Marks)

Answer ALL questions

ALL questions carry EQUAL marks

(10x2 = 20)

- 1 Solve $y = (x-a) p - p^2$.
- 2 Solve $(D^2 - 2mD + m^2) y = 0$.
- 3 Solve $\frac{dz}{dx} = 0$.

Eliminate a and b from $z = (x + a)(x + b)$.

Find $L^{-1} \left(\frac{1}{U^2} \right)$
 $\forall J$

6 Evaluate $\int_0^{\pi} e^{2t} \sin 3t dt$.

Find $L^{-1} (s + a y)$

Write the formula to find $L^{-1} \{f(s)\}$.

Expand $f(x) = x$ as a fourier series in $(-\pi, \pi)$.

- 10 Write the Fourier series expansion of an odd function $f(x)$ in $(-\pi, \pi)$.

SECTION - B (25 Marks)

Answer ALL Questions

ALL Questions Carry EQUAL Marks (5x5 = 25)

- 11 a Solve $x^2 = 1 + p^2$.
OR
b Solve $(D^2 - 3D - 2)y = \sin 3x$.
- 12 a Solve $p(1 + q^2) = q(z - 1)$.
OR
Solve $z = px + qy + y^2 + p^2 + q^2$.

- 13 a Find $L(\sin^2 2t)$.

OR

Find $L^{-1} (q - e^{*})$

- 14 a Find $L^{-1}\{s^{-3}\}$ A
 $\{(s-3)^{-1} + 4\}$
 OR
 b Find $L^{-1}\{(s+2)^{-4}\}$

- 15 a Find a_n in the Fourier series expansion of $f(x) = x$ in $(-\pi, \pi)$.
 OR
 • b Express $f(x) = x$ ($-\pi < x < \pi$) as a Fourier series with period 2π .

SECTION - C (30 Marks)

Answer any THREE Questions

ALL Questions Carry EQUAL Marks (3 x 10 = 30)

- 16 Solve $x^2 - 4x + 3 = \frac{1}{(1-x)^4}$
- 17 Solve $(x^2 - yz)p + (p^2 - zx)q = z^2 - xy$.
- 18 Evaluate $\int_0^{\infty} \frac{e^{-t} - e^{-2t}}{t} dt$.
- 19 Solve $\frac{d^2v}{dt^2} + 2\frac{dv}{dt} - 3v = \sin t$ given that $v(0) = v'(0) = 0$, using inverse Laplace transforms.
- 20 Find Fourier series for
 $f(x) = \begin{cases} 1+x & 0 < x < \pi \\ -1+x & -\pi < x < 0 \end{cases}$

Z-Z-Z

END

PSG COLLEGE OF ARTS & SCIENCE
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BSc DEGREE EXAMINATION MAY 2017
(Second Semester)

Branch - MATHEMATICS WITH COMPUTER APPLICATIONS

NUMERICAL METHODS

Time : Three Hours

Maximum : 75 Marks

SECTION S (20 Marks)

Answer ALL questions

ALL questions carry EQUAL marks

(10 x 2 = 20)

- 1 Find the interval where real root of the equation $x^3 + x^2 - 100 = 0$ lies.
- 2 Write Newton-Raphson formula. ,
- 3 Write the methods that are available to solve system of equations in direct and indirect methods.
- 4 Write the convergence of Gauss-Seidal method.
- 5 Write down the Gregory - Newton backward difference formula for interpolation. *
- 6 Write down the Gauss's central difference formula for interpolation.
- 7 Write down the trapezoidal formula.
- 8 Write down the Newton's forward difference formula for numerical differentiation.
- 9 Write down the Euler's modified formula.
- 10 Write Milne's corrector formula.

SECTION - B (25 Marks)

Answer ALL Questions

ALL Questions Carry EQUAL Marks (5 x 5 = 25)

- 11 a Find the negative root of the equation $x^3 - 2x + 5 = 0$ by iteration method.
OR
b Find the real root of $x^3 - 6x + 4 = 0$ by Newton - Raphson method.
- 12 a Solve by Gauss - Jordan method, the equations
 $2x + y + 4z = 12, 8x - 3y + 2z = 20, 4x + 11y - z = 33.$
OR
b Find the inverse of the matrix $\begin{vmatrix} 4 & 1 & 2 \\ 2 & 3 & -1 \\ 1 & -2 & 2 \end{vmatrix}$ by Gauss elimination method.
- 13 a Apply Gauss's forward formula to find the value of $f(x)$ at $x = 3.75$ from the table .

x:	2.5	3.0	-	3.5	4.0	4.5	5.0
f(x):	24.145	22.043		20.225	18.644	17.262	16.047

OR
b Derive the Stirling's formula.

- 14 a From the following table of values of x and y, find $\frac{dy}{dx}$ at $x = 1.05$.
- | | | | | | | | |
|----|---------|---------|---------|---------|----------|---------|---------|
| x: | 1.00 | 1.05 | 1.10 | 1.15 | 1.20 | 1.25 | 1.30 |
| y: | 1.00000 | 1.02470 | 1.04881 | 1.07238 | 1.069544 | 1.11803 | 1.14017 |

OR

.3

- b Evaluate $\int_{-3}^{\cdot} Jx^4 dx$ using trapezoidal rule.

-3

- 15 a Using Taylor series method, obtain the values of y at $x = 0.1$ (0.1) 0.3, if y satisfies the equation $y' = -xy$.

OR

- b Given $\frac{d^2y}{dx^2} - y^3 = 0$, $y(0) = 10$, $y'(0) = 5$. Evaluate $y(0.1)$ using R - K method.

SECTION - C (30 Marks)

v

* Answer any THREE Questions

ALL Questions Carry EQUAL Marks (3 x 10 = 30)

- 16 Show that the iterative formula for finding the reciprocal of N is

$$X_{n+1} = X_n(2 - NX_n) \text{ and hence find the value of } \frac{1}{N}.$$

- 17 Solve by Gauss Seidal method

$$6x + y + z = 105$$

$$4x + 8y + 3z = 155$$

$$5x + 4y - 10z = 65,$$

- 18 Find the first and second derivative of the function $f(x)$ from the table given below at $x = 0.6$

x:	0.4	0.5	0.6	0.7	0.8
f(x):	1.5886	1.7974	2.0442	2.3275	2.6511

- 19 Use Romberg's method to compute $\int_0^1 \frac{1}{1+x} dx$ correct to 4 decimal places.

Hence deduce an approximate value of n .

- 20 Give $y' = \frac{1}{1+x^2} y^2$ and $y(0) = 1$; $y(0.1) = 1.06$, $y(0.2) = 1.12$, $y(0.3) = 1.21$, evaluate $y(0.4)$ by Milne's predictor - corrector method.

Z-Z-Z

END