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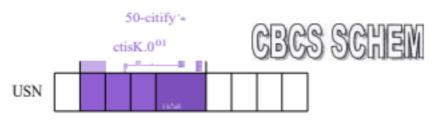
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18MAT21

# Second Semester B.E. Degree Examination, June/July 2019 Advanced Calculus and Numerical Methods

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

## Module-1

1 a. If  $F = V(x3 + y^3 + z^3 - 3xyz)$ , find div F and curl f. (06 Marks)

b. Find the angle between the surfaces  $x^2 + y^2 + z^2 = 9$  and  $z = x^2 + y^2 = 3$  at the point (2, -I, 2).

c. Find the value of a, b, c such that  $f = (axy + bz^3)i + (3x^2 - CZ)j + (3)(Z^2 - y)k$  is irrotational, also find the scalar potential (I) such that F = V4). (07 Marks)

## OR

2 a. Find the total work done in moving a particle in the force field F = 3xyi - 5z] + 10xk along the curve x = t²+1, y = 2t², z = t³ from t = 1 to t = 2. (06 Marks)

b. Using Green's theorem, evaluate

 $f(xy + y^2)dx + x^2dy$ , where C is bounded by y = x and  $y = x^2$ . (07 Marks)

c. Using Divergence theorem, evaluate if ds , where  $F = (x^2 - yz)i + (y^2 - )3 + (z^2 - xy)k$ 

taken over the rectangular parallelepiped  $0 \times a$ ,  $0 \le y \le b$ ,  $0 \le z \le C$ . (07 Marks)

## Module-2

3 a. Solve  $(D^2 - 3D + 2)y = 2x^2 + \sin 2x$ .

(06 Marks)

b. Solve  $(D^2 + 1)y = \sec x$  by the method of variation of parameter.

(07 Marks)

c. Solve  $x^2y'' - 4xy' + 6y = \cos(2 \log x)$ 

(07 Marks)

#### OR

4 a. Solve (D<sup>2</sup> – 4D + 4)y = e<sup>2x</sup> + sin x.

(06 Marks)

b. Solve  $(x+1)^2y'' + (x+1)y' + y = 2\sin[\log_e(x+1)]$ 

(07 Marks)

c. The current i and the charge q in a series containing an inductance L, capacitance C, emf E, satisfy the differential equation L d2q q dt² + = E, Express q and i interms of 't' given that L, C, E are constants and the value of i and q are both zero initially. (07 Marks)

## Module-3

5 a. Form the partial differential equation by elimination of arbitrary function from

c. Derive one dimensional heat equation in the standard form as

 $(0(x + y + z, x^2 + y^2 + z^2) = 0$  (06 Marks)

b. Solve  $\underset{\text{ax } 2\mathbf{a}_y}{\mathbf{z}8^3} - \cos(2x + 3y)$ 

(07 Marks)



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#### OR

6 a. Solve 
$$\frac{a}{ax} + z = 0$$
 such that  $z = ey$  where  $x = 0$  and  $\frac{oz}{ax} = 1$  when  $x = 0$ . (06 Marks)

b. Solve 
$$(mz - ny) = \frac{m}{ax} + (nx - e) = \frac{nz}{aV} = ey mx$$
 (07 Marks)

c. Find all possible solutions of one dimensional wave equation method of separation of variables. c. Find all possible solutions of one dimensional wave equation at each of the control of the contr

## Module-4

7 a. Discuss the nature of the series  $\frac{1}{n} \frac{(n+1)^n}{n^{n+1}} x^n$ . (06 Marks)

b. With usual notation prove that  $J_{i:2}(x) = \frac{2}{nx} \sin x$  (07 Marks)

c. if  $x^3 + 2x^2 - x + 1 = aP3 + bP2$  el)! + dPo, find a, b, c and d using Legendre's polynomial.

(07 Marks,

### OR

8 a. Discuss the nature of the series

$$\frac{x}{1.2} \frac{x}{3.4} \frac{x}{3.4}$$
 (06 Marks)

h. Obtain the series solution of Legendre's differential equation in terms of P n(x)

$$(1-x^2)y'' - 2xy' + n(n+1)y = 0$$
 (07 Marks)

c. Express x<sup>4</sup> – 3x<sup>2</sup> + x interms of Legendre's polynomial. (07 Marks)

#### Module-5

- 9 a. Find the real root of the equation xsinx + cosx = 0 near x = π using Newton-Raphson method. Carry out 3 iterations. (06 Marks)
  - b. From the following data, find the number of students who have obtained (i) less than 45 marks (ii)between 40 and 45 marks.

Marks	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80
No. of Students	31	42	51	35	31

(07 Marks)

e. Evaluate I + x dx using Simpson's — rule by taking 7 ordinates. (07 Marks)

#### OR

- a. Find the real root of the equation x login x = L2 which lies between 2 and 3 using Regula-Falsi method. (06 Marks)
  - b. Using Lagrange's int

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	Х	0	1	2	5	
	у	2	3	12	147	

(07 Marks)

c. Evaluate i'loge x dx using Weddle's rule by taking six equal parts.

(07 Marks)



