2020
MATHEMATICS HONOURS
SEMESTER-3
INTERNAL ASSESSMENT
Full Marks of each Course: 10

The figures in the margin indicate full marks .
Symbols and notations used here carry their usual meaning.
Candidates are required to give their answers in their own words as far as practical.

Course: CC5
(Theory of Real Functions)

Answer all the questions with proper justification: 5x2=10

1. $\lim_{x\to 0} x sin\frac{1}{x^3}$
   a) is equal to 1
   b) is equal to 0
   c) is equal to -1
   d) undefined

2. The function $f(x) = sinx, x \in R$, is
   a) Continuous on R but not Uniformly continuous on R
   b) Nowhere continuous
   c) Uniformly continuous on R
   d) None of these

3. Let $f: [0,1] \to [0,1]$ be continuous on $[0,1]$ and assumes only rational values. If $f\left(\frac{1}{2}\right) = \frac{1}{2}$. Then,
   a) $f(x) = \frac{1}{2}$ only for all $x \in [0,1] \cap Q$
   b) $f(x) = \frac{1}{2}$ only for all $x \in [0,1] \backslash Q$
   c) $f(x) = \frac{1}{2}$ for all $x \in [0,1]$
   d) None of these

4. Let $f: R \to R$ be defined by $f(x) = x^2 sin\frac{1}{x^2},\ x \neq 0$
   $= 0,\ x = 0$
   a) f is not differentiable on R
   b) f is continuously differentiable on R
   c) f is differentiable on R but f' is not continuous on R
   d) None of these

5. Let a function f is differentiable on $[0,2]$ and $f(0) = 0, f(1) = 2, f(2) = 1$. Then
   a) $f'(0) = 0$ for any such function.
   b) $f'(x) = 0$ for all x in $[0,2]$
   c) $f'(c) = 0$ for some c in $(0,1)$
   d) none of these

Course: CC6
(Ring Theory & Linear Algebra-I)

Answer all the questions with proper justification: 5x2=10

6. The eigen values of $A = \begin{pmatrix} 1 & -1 & 0 \\ 1 & 2 & -1 \\ 3 & 2 & -2 \end{pmatrix}$ are

a. 1, i, -i b. 1, 1, 1 c. 1, -1, 1 d. 1, ½ , -1/2

7. Let V be a vector space of dimension n over a field F. Then which one is true?

a. generating set of V contains less than n vectors

b. no linearly independent set of vectors contains more than n vectors

c. every generating set of vectors is a subset of a basis.

d. none of the above.

8. Ring containing no divisor of zero is

a. $(\mathbb{Z}_6, +, .)$ b. $(M_2(\mathbb{R}), +, .)$ c.$(\mathbb{Z}, +, .)$ d. None of these.

9. Which one is an Integral Domain

a. $(\mathbb{Z}_8, +, .)$ b. $(4\mathbb{Z}, +, .)$ c. $(M_n(\mathbb{Z}), +, .)$ d. $(\mathbb{Z}_7, +, .)$

10. A finite ring having no divisor of zero is

a. a ring without unity b. a ring with unity c. a commutative ring d. a non-commutative ring.

Course: CC7
(ODE & Multivariate Calculus-I)

Answer all the questions with proper justification: 5x2=10

11. Which of the following is a correct statement? $\frac{dy}{dx} = f(x, y)$

a) always possess a solution b) never possess a solution
c) possess a unique solution if solution exists d) none of these

12. Number of integrating factors(if it exist) of an first order ordinary differential equation are
a) 1 b) 2 c) 3 d) none of these

13. If u and v be two solutions of $D^2y + Py + Q = 0$ where P and Q are constants, then
a) $u + v$ is always a general solution of the above equation b) $u + v$ is a general solution of the above equation if both u and v are continuous c) $u + v$ is a general solution of the above equation if both u and v are differentiable d)none of these

14. In the ordinary differential equation $\left(x - \frac{\pi}{2}\right)^3 \frac{d^2y}{dx^2} + \cos x \frac{dy}{dx} + (\sin x)\, y = 0$, $x = \frac{\pi}{2}$ is

a) ordinary point b) regular singular point c) irregular singular point
d) none of these

15. If $f(x,y)=\dfrac{\sin\left(x^2+y^2\right)}{x^2+y^2}$ when $(x,y)\neq(0,0)$, what should be value of $f(0,0)$ to make $f(x,y)$ continuous at origin?

a) 0 b) 1 c) -1 d) 2

Course: SECA1
(C Programming Language)

Answer all the questions with proper justification: 5x2=10

16. 4+6/3*2-2+7%3 evaluates to
    a) 3
    b) 4
    c) 6
    d) 7

17. Operator % in C language is called?
    a) Percentage Operator
    b) Quotient Operator
    c) Modulus
    d) Division

18. Name the loop that executes at least once
    a) for
    b) if
    c) do-while
    d) while

19. Which of the following is not a valid variable name declaration?
    a) flote PI=3.14
    b) double PI=3.14
    c) int PI=3.14
    d) #define PI 3.14

20. Which type of conversion is NOT accepted?
    a) from char to int
    b) from float to char pointer
    c) from negative int to char
    d) from double to char