2021
MATHEMATICS HONOURS
SEMESTER-3
Internal Assessment
Full Marks in each Course: 10

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.
Notations and symbols have their usual meaning.

Course: CC5
(Theory of Real Functions)

Choose the correct alternative with proper justification. 5x2=10

1. 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

2. 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

3. Let $f(x) = |x-1| + |x-2|, x \in [0,3]$. Then
   (a) f has global maximum at x=1 and x=2
   (b) f has global minimum at x=0 and x=3
   (c) f has local maximum at x=1 and x=2
   (d) f has local minimum at x=1 and x=2

4. Let $D \subset R$ and $f: D \to R$ be a function. If c be an isolated point of D then f
   (i) Is continuous at c (ii) is not continuous at c (iii) may or may not continuous at c (iv) obeys none of (i), (ii) and (iii).

   Justify yourself.

5. The value of $\lim_{x \to 0+} \sqrt{x - [x]}$ is

   (i)-1 (ii) 0 (iii)1 (iv) 2
   Give reason in support of your answer.

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

Choose the correct alternative with proper justification. 5x2=10

6. Let S and T be two subrings of a ring R. Then which one is true

a. $S \cup T$ be a subring of R b. $S \cap T$ may be a subring of R

c. $S \cup T$ may not be a subring of R d. $None\ of\ these$.

7. If R be commutative ring without unity and a $a \in R$. Then

a. Ra is a Principal ideal of R b. Ra is an ideal of $R\ and\ a \in R$

c. Ra is an Principal ideal of $R\ and\ a \notin R$ d. Ra is an ideal of $R\ and\ a \notin R$.

8. $w = \{(x, y, z) \in R^3 : x + y + z = 0\}$ is a subspace of R^3.Dimension of W is

a. 1 b. 0 c. 2 d. 3

9. A= $\begin{bmatrix} 1 & -1 & 0 \\ 1 & 2 & -1 \\ 3 & 2 & -2 \end{bmatrix}$ Eigen Values of A are

a. 1, -1,-1 b. 1,0,0 c. -1,-1,0 d. 1,1,-1

10. A mapping T:$R^3 \to R^3$is defined by T(x, y, z)=$(x + y + z, 2x + y + 2z, x + 2y + z), (x, y, z) \in R^3$

Nullity of the mapping is

a. 1 b. 0 c. 3 d. 2

Course: CC7
(ODE & Multivariate Calculus-I)

Choose the correct alternative with proper justification. 5x2=10

11. Integrating factor of a first order ordinary differential equation

(a) always exist and unique (b) always exist and infinite (c) may not exist (d) if exists, it must be unique

12. 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 (a), (b) or (c)

13. P.I of $\left(D^3-1\right)y=x^3-x^2$ is

(a) x^3+x^2+6 (b) x^3-x^2-6 (c) $-x^3+x^2-6$ (d) $-x^3+x^2+6$

14. $\lim_{(x,y)\to(0,0)} \frac{121x^{-5}y^{\frac{13}{3}}}{y+x^{\frac{3}{2}}}$ is

(a) 121 (b)0 (c) 0 (d) 1

15. Let $S=\mathbb{N}\times\mathbb{Q}\times(\mathbb{R}-\mathbb{Q})$ then the derive set of S is

(a) $\mathbb{N}\times\mathbb{R}\times\mathbb{R}$ (b) $\mathbb{N}\times\mathbb{Q}\times\mathbb{R}$ (c) $\mathbb{R}\times\mathbb{R}\times\mathbb{R}$ (d) $\mathbb{N}\times\mathbb{Q}\times(\mathbb{R}-\mathbb{Q})$

Course: SECA1
(C Programming Language)

Choose the correct alternative with proper justification. 5x2=10

16. The expretion of $e^x+\cos\ x^2$ in C is

a) $\exp(x)+cosx^2$
b) $\exp(x)+\cos\left(pow(x,2)\right)$
c) $\exp(x)+\cos pow(x,2)$
d) $e(x)+cosx^2$

17
```
#include<stdio.h>
#include<conio.h>
int main()
{
int x,y;
x=2021;
x=x++;
y=x+2;
printf("%d",y);
getch();
}
```

The output of the above program is

a) 2021
b) 2022
c) 2023
d) 2024

18. Which of the following looping structure is correct

a)
```
for(initial value,condition,increment or decrement)
{
one or more C statement;
}
```

b) for(initial value;condition;increment or decrement);
{
one or more C statement;
}
c) for(initial value;condition;increment or decrement)
{
one or more C statement;
}
d) for(initial value;condition;increment or decrement)
{
one or more C statement
}

19. #include<stdio.h>

#include<conio.h>

int main()

{
int x,y;
x=22;
y=4;
printf("%d",x/y);
getch();
}
The output of the above program is
a) 5
b) 5.50
c) 5.00
d) none of above

20. n%2==0 means

a) n is divisible by 2.
b) n is not divisible by 2
c) n may or may not be divisible by 2
d) none of above