Q.29 Find the centre and radius of the circle

$$x^2 + y^2 - 10x - 10y - 4 = 0.$$

Q.30 Evaluate the following limit:

$$\lim_{x \to 0} \frac{5^{\tan x} - 1}{x}$$

Q.31 Find $\frac{d^2y}{dx^2}$, if $y = (x + 1)^2 e^{-x}$.

Q.32 Evaluate $\int x^2 \log x \, dx$.

Q.33 Find the area bounded by the parabola $y = 4x^2$, $x > 0$, the y–axis, and the lines $y = 1$ and $y = 4$.

Q.34 Solve the differential equation $\frac{d^2y}{dx^2} + 6\frac{dy}{dx} + 9y = 5e^{3x}$.

Q.35 Solve the following differential equation by variable separable method: $\frac{dy}{dx} = xy + x + y + 1$

SECTION-D

Note: Long answer type questions. Attempt any one question out of three questions. (1x10=10)

Q.36 Find the coordinates of the foci, the vertices, the lengths of major and minor axes and the eccentricity of the ellipse $4x^2 + 25y^2 = 100$

Q.37 Find all the points of local maxima & local minima and their corresponding local maximum & local minimum values of the function $f(x) = -x^3 + 75x + 15$.

Q.38 Apply Simpson's rule to find the approximate value of

$$\int_2^{14} (x^2 + x) dx$$

by taking 6 equal subintervals of $2 \le x \le 14$.

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Roll No. .....

202012

1st Year / Common

Subject : Applied Mathematics

Time : 3 Hrs. M.M. : 100

SECTION-A

Note: Multiple choice questions. All questions are compulsory (10x1=10)

Q.1 n^{th} term of the A.P. u, $u + v$, $u + 2v$, ... is

a) $u + nv$ b) u + (n – 1)v

c) $u + (n + 1)v$ d) $2u + nv$

Q.2 sec 30° = _____

a) 2 b) 1

c) 0 d) None of these

Q.3 Fill in the blank:

90 degrees = _____ grades

a) 100 b) 200

c) 300 d) 400

Q.4 sin 2x = _____

a) $1 - \sin^2 x$ b) $2 \sin x \cos x$

c) $1 - 2 \sin^2 x$ d) None of these

Q.5 In which quadrant the point $(-\sqrt{2}, 2\sqrt{3})$ lies?

a) 4^{th} b) 1^{st}

c) 2^{nd} d) 3^{rd}

Q.6 Fill in the blank

$$\lim_{x \to 0} \frac{tan\ 2x}{x} = \_\_\_\_\_$$

a) 0 b) 2

c) 1 d) None of these

Q.7 If u and v are some functions of x, then $\frac{d}{dx}(u.v) =$ ____

a) $v\frac{d\,u}{d\,x} + u\frac{d\,v}{d\,x}$ b) $v\frac{d\,v}{d\,x} + u\frac{d\,u}{d\,x}$

c) $v\frac{d\,v}{d\,x} + u\frac{d\,u}{d\,x}$ d) None of these

Q.8 $\int \cos 4x\, dx =$ _____

a) $\frac{\cos 4x}{4} + c$ b) $\frac{\sec 4x}{4} + c$

c) $\frac{\sin 4x}{4} + c$ d) None of these

Q.9 If $f(t)$ is defined on the interval $a \le t \le b$, then the average value of the function is given by

a) $\frac{1}{b-a}\int_a^b f(t)dt$ b) $\sqrt{\frac{1}{b-a}\int_a^b [f(t)]dt}$

c) $b - a$ d) None of these

Q.10 Which of the following is a homogeneous differential equation?

a) $x^{-4}dx = y^2dy$ b) $(x^2-xy)dy = (xy+y^2)dx$

c) $x^{-4}dx = y^5dy$ d) $(x^2+1)dy - xy^2dx = 0$

SECTION-B

Note: Objective Completion type questions. All questions are compulsory. (10x2=20)

Q.11 Evaluate ${}^{12}P_7$.

Q.12 How many middle terms are there in the Binomial expansion of $(7x - 2y)^{11}$?

Q.13 State the Napier's Analogy.

Q.14 Write the formula to find the distance between two given points.

Q.15 Write the slope-intercept form of the straight line.

Q.16 Write the general equation of the circle.

Q.17 $\frac{d}{dx}(x\,e^x) =$ _____.

Q.18 What is the value of $\int cot\, x\, dx$?

Q.19 Evaluate $\int_0^3 3x^2 dx$.

Q.20 Give an example of non-linear ordinary differential equation.

SECTION-C

Note: Short answer type questions. Attempt any ten questions out of fifteen questions. (10x6=60)

Q.21 If the sum of three numbers of G.P. 38 and their product is 1728, find these numbers.

Q.22 Find the middle term in the binomial expansion of $\left(\frac{x^2}{3} - \frac{3}{2x}\right)^{12}$

Q.23 Resolve the following into partial fractions:

$$\frac{2x-1}{(x-2)(x+1)}$$

Q.24 Evaluate $\frac{\tan 69^\circ + \tan 66^\circ}{1 - \tan 69^\circ \tan 66^\circ}$

Q.25 Prove that $\frac{\sin A + \sin 3A}{\cos A - \cos 3A} = \cot A$.

Q.26 If $\cos A = \frac{4}{5}$ and A is an acute angle, find the value of $\tan 2A$.

Q.27 If any triangle if the sides are $\sqrt{2}$, $\sqrt{3}$ and $\sqrt{5}$, then show that its area is $\frac{\sqrt{6}}{2}$ sq. units.

Q.28 Find the equation of the straight line passing through P(–3, 5) and perpendicular to the line joining the points A (2, 5) and B(–3, 6).