Kanyakumari District Schools

Common Second Mid Term Test, November - 2014

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Standard 12

Time: 1.30 Hrs. **MATHEMATICS** Marks: 100

Section - A

Note: i) Answer all the questions.
ii) Choose the best answer from the given four alternatives.

1) The value of $\int_0^1 x(1-x)^4\,dx$ is

a) 1/12 b) 1/30 c) 1/24 d) 1/20

2) The value of $\int_0^{\pi/4} \cos^3 2x\,dx$ is

a) 2/3 b) 1/3 c) 0 d) $2\pi/3$

3) The area bounded by the parabola $y^2 = x$ and its latus rectum is

a) 4/3 b) 1/6 c) 2/3 d) 8/3

4) The area bounded by the line y = x, the x-axis, the ordinates x = 1, x = 2 is

a) 3/2 b) 5/2 c) 1/2 d) 7/2

5) Volume of solid obtained by revolving the area of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ about major and minor axes are in the ratio

a) $b^2:a^2$ b) $a^2:b^2$ c) a:b d) b:a

6) The surface area of the solid of revolution of the region bounded by y = 2x, x = 0 and x = 2 about x-axis is

a) $8\sqrt{5}\pi$ b) $2\sqrt{5}\pi$ c) $\sqrt{5}\pi$ d) $4\sqrt{5}\pi$

7) The arc length of the curve y = f(x) from x = a to x = b is

a) $\int_a^b \sqrt{1+\left(\frac{dy}{dx}\right)^2}\,dx$ b) $\int_c^d \sqrt{1+\left(\frac{dx}{dy}\right)^2}\,dx$

c) $2\pi\int_a^b y\sqrt{1+\left(\frac{dy}{dx}\right)^2}\,dx$ d) $2\pi\int_a^b y\sqrt{1+\left(\frac{dx}{dy}\right)^2}\,dx$

8) $\int_0^{2a} f(x)\,dx = 0$ if

a) f(2a−x) = f(x) b) f(2a−x) = −f(x)
c) f(x) = −f(x) d) f(−x) = f(x)

9) The integrating factor of $dx+xdy = e^{-y}\sec^2 y\,dy$ is

a) e^x b) e^{-x} c) e^y d) e^{-y}

10) The differential equation of all non-vertical lines in a plane to x-axis is

a) $\frac{dy}{dx} = 0$ b) $\frac{d^2y}{dx^2} = 0$ c) $\frac{dy}{dx} = m$ d) $\frac{d^2y}{dx^2} = m$

11) The differential equation obtained by eliminating a and b from $y = ae^{3x}+be^{-3x}$ is

a) $\frac{d^2y}{dx^2} + ay = 0$ b) $\frac{d^2y}{dx^2} - 9y = 0$

c) $\frac{d^2y}{dx^2} - 9\frac{dy}{dx} = 0$ d) $\frac{d^2y}{dx^2} + 9x = 0$

12) The P.I. of $(3D^2+D-14)y = 13e^{2x}$ is

a) $26xe^{2x}$ b) $13xe^{2x}$ c) xe^{2x} d) $x^2/2e^{2x}$

13) The order and degree of the differential equation are

$$\frac{d^2y}{dx^2} = \left[4 + \left(\frac{dy}{dx}\right)^2\right]^{3/4}$$

a) 2, 1 b) 1, 2 c) 2, 4 d) 4, 2

14) The differential equation corresponding to $xy = c^2$ where c is an arbitrary constant is

a) xy"+x = 0 b) y" = 0 c) xy'+y = 0 d) xy"−x = 0

15) If cos x is an integrating factor of the differential equation

$\frac{dy}{dx} + Py = Q$ then P =

a) −cot x b) cot x c) tan x d) −tan x

16) The complementary function of $(D^2+1)y = e^{2x}$ is
a) $(Ax+B)e^x$ b) $A \cos x + B \sin x$
c) $(Ax+B)e^{2x}$ d) $(Ax+B)e^{-x}$

17) The conditional statement $p \rightarrow q$ is equivalent to
a) $p \vee q$ b) $p \vee \sim q$ c) $\sim p \vee q$ d) $p \wedge q$

18) Which of the following is contradiction?
a) $p \vee q$ b) $p \wedge q$ c) $p \vee \sim p$ d) $p \wedge \sim p$

19) If a compound statement is made up of three simple statements, then the number of rows in the truth table is
a) 8 b) 6 c) 4 d) 2

20) The truth values of the following statements are
(i) Paris is in France
(ii) sin x is an even function
(iii) Every square matrix is non-singular
(iv) Jupiter is a planet
a) TFFT b) FTFT c) FTTF d) FFTT

Section - B

N.B. i) Answer any five questions.
ii) Questions no. 27 is compulsory and choose any 4 questions from the remaining.
iii) Each question carries six marks.

21) Evaluate: (i) $\int_{-\pi/4}^{\pi/4} x^3 \cos^3 x \, dx$ (ii) $\int_{-\pi/4}^{\pi/4} x \sin^2 x \, dx$

22) Evaluate: $\int_{\pi/6}^{\pi/3} \frac{dx}{1+\sqrt{\cot x}}$

23) Form the differential equation from the equation $Ax^2+By^2 = 1$

24) Solve: $\frac{dy}{dx} = \sin(x+y)$

25) Find the equation of the curve passing through (1, 0) and which has slope $1+\frac{y}{x}$ at (x, y)

26) Construct the truth table for $(p \vee q) \wedge (\sim r)$

27) a] Find the volume of the solid that results when the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ (a>b>0) is revolved about the minor axis.

(OR)

b] Show that $p\leftrightarrow q \equiv [(\sim p)\vee q)]\wedge[(\sim q)\vee p)]$ using truth tables.

Section - C

N.B. i) Answer five questions. **5×10=50**

ii) Question no. 34 is compulsory and choose any 4 from the remaining.

28) Find the area between the curves $y = x^2-x-2$, x-axis and the lines $x = -2$ and $x = 4$.

29) Find the common area enclosed by the parabolas $y^2 = x$ and $x^2 = y$.

30) Find the length of the curve $\left(\frac{x}{a}\right)^{2/3}+\left(\frac{y}{a}\right)^{2/3}=1$.

31) Radium disappears at a rate proportional to the amount present. If 5% of the original amount disappears in 50 years, how much will remain at the end of 100 years. [Take A_0 as the initial amount].

32) Solve: $\frac{d^2y}{dx^2}-3\frac{dy}{dx}+2y=2e^{3x}$ when $x = \log 2$, $y = 0$ and when $x = 0$, $y = 0$.

33) Solve: $(x^2+y^2)dx + 3xydy = 0$.

34) a] Prove that the curved surface area of a sphere of radius r intercepted between two parallel planes at a distance a and b from the centre of the spere is $2\pi r(b-a)$ and hence deduct the surface area of the sphere. (b>a).

(OR)

b] Solve: $(1+y^2)dx = (\tan^{-1}y-x)dy$

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