KENDRIYA VIDYALAYA SITAPUR I SHIFT

UT-2 (2023-24)

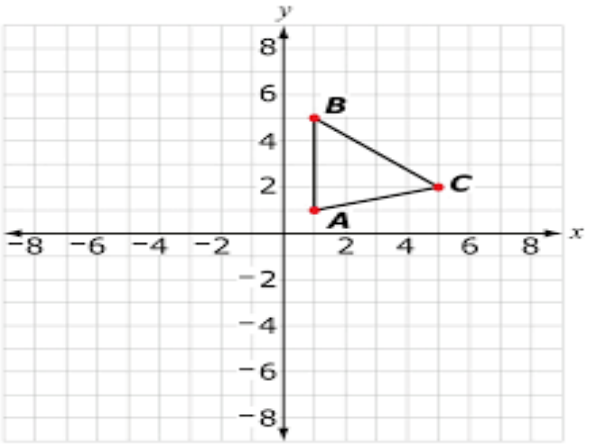
Class: XII | Max. Marks: 40

Subject: -Mathematics | Time: 90 minutes

General Instructions:

1. This question paper contains five sections – A, B, C, D and E. Each part is compulsory.
2. Section A has 8 multiple choice type questions of 1 mark each and 1 assertion reasoning question of 1 mark each.
3. Section B has 2 questions of 2 marks each.
4. Section C has 3 questions of 3 marks each,
5. Section D has 2 questions of 5 marks each
6. Section E has 2 case based questions of 4 marks each
7. There is an internal choice in some of the questions.

Q.NO	**Section A**	Marks
	Q (1-10) are multiple choice type questions. Select the correct option	
1	$\int \frac{e^x(1+x)}{cos^2(e^x x)}$ dx equals to a) $\tan(e^x) + c$ b) $\cot(e^x) + c$ c) $\tan(x\, e^x) + c$ d) $-\cot(e^x) + c$	1
2	The number of arbitrary constants in the particular solution of a differential equation of third order is: a) 3 b) 2 c) 1 d) 0	1
3	The area bounded by the curve $y = sin\, 2x$, x-axis and the lines x $\frac{\pi}{4}$ and $x = \frac{3\pi}{4}$ is: (a) 1 sq. units (b) 2 sq. units (c) 4 sq. units (d) 32 sq. units	1
4	$\int \frac{x^4+1}{x^2+1}$ dx equals to a) $\frac{x^3}{3} + x - x + c$ b) $\frac{x^3}{3} - x - x + c$ c) $\frac{x^3}{3} + x - 2x + c$ d) none of these	1
5	The value of "a" if $\int_0^a \frac{1}{4+x^2} dx = \frac{\pi}{8}$ a) 2 b) 1 c) 0 d) none of these	1
6	The area bounded by the parabola y^2 $8x$, the x-axis and the latus rectum is: (a) $\frac{16}{3}$ (b) $\frac{23}{3}$ (c) $\frac{32}{3}$ (d) $\frac{16\sqrt{2}}{3}$	1
7	The degree of the differential equation $\frac{d^4y}{dx^4} + \sin\left(\frac{d^3y}{dx^3}\right) = 0$ is a)4 b) 3 c) 1 d) not defined	1
8	Given, $\int e^x(\tan tan\, x + 1)\sec sec\, x\, dx = e^x f(x) + c$. Then f(x) is a) $\sec sec\, x \tan tan\, x$ b) $\sec sec\, x$ c) x d) none of these	1
9	In the given question, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices. a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A. c) A is true but R is false. d) A is false but R is true.	

	Assertion (A): $\int_{-\frac{1}{2}}^{\frac{1}{2}} log\left(\frac{1+x}{1-x}\right) dx = 0$ Reason (R): $\int_{-a}^{a} f(x)\, dx = 0$ if $f(-x) = f(x)$	
	Section B	
10	Find the particular solution of the differential equation $\frac{dy}{dx} = \frac{1+y^2}{1+x^2}$ given that $y = 1$ when $x = 0$	2
11	Evaluate $\int \frac{1-\sin sin\, x}{cos^2 x}\, dx$	2
	Section C	
12	Evaluate $\int_0^{\pi/2} \sin sin\, 2x\, log(\tan tan\, x)\, dx$ or $\int_0^{\pi} \frac{x \sin sin\, x}{1+x}\, dx$	3
13	Find the area of the region bounded by the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$	3
14	Find the general solution of the differential equation $y\, dx - \left(x + 2y^2\right)dy = 0$	3
	Section D	
15	Evaluate: $\int \frac{x+3}{\sqrt{5-4x-x^2}}\, dx$	5
16	Solve the differential equation $(x - y)\frac{dy}{dx} = x + 2y$ Or Find the general solution of the differential equation $x\frac{dy}{dx} + y - x + xy\, cotx = 0\ (x \neq 0)$	5
	Section E (CASE BASED QUESTIONS)	
17	Three children Amit(A), Sumit(B) and Rohit(C) are playing in a park with toy telephones and had tightly caught the wires joining telephones to form a triangle as shown in figure: Based on the above information answer the following questions: (i) Find the equation of line representing the wire AB. (ii) Find the equation of line representing the wire BC. (iii) Find the equation of line representing the wire AC. (iv) Find the area of triangle ABC using integration 	1x4=4
18	Polio drops are delivered to 50K children in a district. The rate at which polio drops are given is directly proportional to the number of children who have not been administered the drops. By the end of 2nd week half the children have been given the polio drops. How many will have been given the drops by the end of 3rd week can be estimated using the solution to the differential equation $\frac{dy}{dx} = k(50 - y)$ where x denotes the number of weeks and y the number of children who have been given the drops.	1x4=4

	(i)	State the order of the above given differential equation.	
	(ii)	Which method of solving a differential equation can be used here?	
	(iii)	Find the solution of the differential equation $\frac{dy}{dx} = k(50 - y)$	
	(iv)	Find the value of c in the particular solution given that y(0)=0 and k = 0.049.	