K. J. Somaiya Institute of Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)

Supplementary Exam August 2022-23
Program: FY B.Tech Scheme : II
Supplementary Examination: FY   Semester: II
Course Code: BSC201 and   Course Name: Engineering Mathematics-II

Date of Exam: 08/08/2023 | Duration: 2.5 Hours | Max. Marks: 60

i)	Solve $(x^4 + y^4)dx - xy^3dy = 0$	04	C01	3
ii)	Solve $(D^2 + 2D + 1)y = xe^{-x}\cos x$	04	C02	3
iii)	Evaluate $\int_0^1 x^3 \left(\log\frac{1}{x}\right)^4 dx$	04	C03	3
iv)	Find the length of the cardioid $r = a(1 - \cos\theta)$ lying outside the circle $r = a\cos\theta$.	04	C03	3
v)	Evaluate $\iint r^3 dr\, d\theta$ over the area bounded between the circles $r = 2\sin\theta$ and $r = 4\sin\theta$.	04	C04	3
vi)	Using Euler's method find the approximate value of y when $\frac{dy}{dx} = x^2 + y^2$ and $y(0) = 1$, at $x = 1$ in five steps.	04	C06	3
Q.3	**Solve any two questions out of three.**	16		
i)	Solve $(1 + siny)\frac{dx}{dy} = \{2ycosy - x(\sec y + tany)]$.	08	CO1	3
ii)	Apply method of variation of parameter to solve $(D^2 - 4D + 4)y = e^{2x}\sec^2 x$	08	CO2	3
iii)	Change the order of integration and evaluate $\int_0^2 \int_{2-\sqrt{4-y^2}}^{2+\sqrt{4-y^2}} dx\, dy$	08	CO4	3
Q.4	**Solve any two questions out of three.**	16		
i)	Assuming the validity of differentiation under the integral sign prove that $\int_0^\infty \frac{\log(1+ax^2)}{x^2} dx = \pi\sqrt{a}$.	08	CO3	3
ii)	Evaluate $\iint x(x - y)\, dxdy$ over the region R which is triangle whose vertices are $(0,0),\ (1,2),\ (0,4)$	08	CO4	3
iii)	Using Runge-Kutta method of 2nd order find the value of y satisfying the equation $\frac{dy}{dx} = x - y^2,\ y(0) = 1$, for $x = 0.1$ correct upto 4 places by taking $h = 0.05$.	08	CO6	3

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Instructions:
(1) All questions are compulsory.
(2) Draw neat diagrams wherever applicable.
(3) Assume suitable data, if necessary.

		Max. Marks	CO	BT level
Q 1	**Solve any six questions out of eight:**	12		
i)	Determine whether the differential equation given below is exact or not? $y(2xy+1)dx + x(1+2xy-x^3y^3)dy = 0$	02	CO1	3
ii)	Find the complementary function of the differential equation $(D^3 + 3D)y = \cosh 2x \sinh 3x$	02	C02	3
iii)	Find the particular integral of the differential equation $(D^2 - 4D + 4)y = e^x + \cos 2x$	02	C02	3
iv)	Prove that $\beta(x,x) = \frac{1}{2^{2x-1}}\beta\left(x, \frac{1}{2}\right)$	02	C03	3
v)	Find the length of the curve $x^{2/3} + y^{2/3} = a^{2/3}$.	02	C03	3
vi)	Evaluate $\int_0^1 \int_{x^2}^x xy(x^2 + y^2)\,dy\,dx$	02	C04	3
vii)	Evaluate $\int_0^{\pi/4} \int_0^{\sqrt{\cos 2\theta}} \frac{r}{(1+r^2)^2}\,dr\,d\theta$	02	C04	3
viii)	Find the value of $\int_0^\pi \sin x\, dx$ by Simpson's 1/3rd Rule using the following data.	02	C06	3

x	0	$\frac{2\pi}{10}$	$\frac{4\pi}{10}$	$\frac{6\pi}{10}$	$\frac{8\pi}{10}$	π
$\sin x$	0	0.5878	0.9511	0.9511	0.5878	0

		Max. Marks		
Q.2	**Solve any four questions out of six.**	16		