

July / Aug 2023-24

Program: FY B.Tech Scheme : III

Supplementary Examination: FY Semester: II

Course Code: BSC201 and Course Name: Engineering Mathematics-II

Date of Exam: *08/08/2024*

Duration: 2.5 Hours

Max. Marks: 60

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)	Check whether the following differential equation is exact or not $(x^2 - 4xy - 2y^2)dx + (y^2 - 4xy - 2x^2)dy = 0$	02	CO1	3
ii)	Find the integrating factor of the following non-exact differential equation $x^2y dx - (x^3 + y^3)dy = 0$.	02	C01	3
iii)	Find complementary function for the following differential equation $\frac{d^4y}{dx^4} + 2\frac{d^2y}{dx^2} + y = 0$.	02	C02	3
iv)	Find particular integral of the following differential equation $(D^3 + 1)y = e^{-x}$.	02	C02	3
v)	Prove that $\beta(m, n) = \beta(m + 1, n) + \beta(m, n + 1)$.	02	C03	3
vi)	Evaluate $\int_0^4 \int_{y^2/4}^y xy dx dy$.	02	C04	3
vii)	Find limits for the below double integral to find area of the region inside the circle $r = a \sin \theta$ and outside the cardioid $r = a(1 - \cos \theta)$ $A = \int \int r dr d\theta$.	02	C05	3
viii)	Using Euler's method find the approximate value of y at $x = 0.04$, given that $\frac{dy}{dx} = \frac{y-x}{y+x}$ and $y(0) = 1, h = 0.02$.	02	C06	3
Q.2	Solve any four questions out of six.	16		
i)	Solve $\frac{dy}{dx} + y \tan x = \sec^2 x$.	04	C01	3

K. J. Somaiya Institute of Technology, Sion, Mumbai-22
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ii)	Solve $(D^2 - 4D + 3)y = 3e^x \cos 2x$.	04	C02	3
iii)	Find the length of the arc of the cycloid $x = a(\theta - \sin \theta)$, $y = a(1 + \cos \theta)$, from $\theta = 0$ to point 2π .	04	C03	3
iv)	Evaluate $\int \int dx dy$ over the area bounded by $y = x^2$ & $x + y = 2$.	04	C04	3
v)	Find by double integration the area bounded by $r = 4 \sin \theta$ and $r = 8 \sin \theta$.	04	C05	3
vi)	Use Simpsons $3/8^{\text{th}}$ rule to find $\int_4^{5.2} \ln x dx$ by dividing the interval in 6 sub-intervals.	04	C06	3
Q.3	Solve any two questions out of three.	16		
i)	Find the solution to differential equation $\frac{dy}{dx} + \frac{2}{x}y = \frac{y^3}{x^3}$.	08	CO1	3
ii)	Using method of variation of parameters find particular integral of $(D^2 - 6D + 9)y = \frac{e^{3x}}{x^2}$.	08	CO2	3
iii)	Assuming the validity of DUIS rule, prove that $\int_0^{\infty} \frac{e^{-ax} \sin x}{x} dx = \cot^{-1} a$.	08	CO3	3
Q.4	Solve any two questions out of three.	16		
i)	Change the order of following integration and evaluate $\int_0^2 \int_0^{x^2} x(x^2 + y^2) dy dx$.	08	CO4	3
ii)	Evaluate the integral $\iiint dx dy dz$ over the volume of the tetrahedron bounded by the planes $x = 0, y = 0, z = 0, \frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$.	08	CO5	3
iii)	Solve $\frac{dy}{dx} = x + y^2, y(0) = 1$, at $x = 0.2$ taking $h = 0.1$ using Runge-Kutta method of fourth order.	08	CO6	3
