12/12/22

K. J. Somaiya Institute of Engineering and Information Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)
End Semester Exam Nov-Dec-22

Program: B.Tech
Examination: FY Semester: II
Course Code: 1UBSC201 and Course Name: Engineering Mathematics II
Duration: 03 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)	Find an integrating factor for the differential equation $y(2xy+1)dx + x(1+2xy-x^3y^3)dy = 0$	02	CO1	3
ii)	Find the complete solution for the differential equation $(D^3+3D)y = 0$	02	C02	3
iii)	Find the particular integral for the differential equation $(D^2+1)y = cosx$	02	C02	3
iv)	Express $\beta(\frac{1}{2},\frac{1}{2})$ in terms of Gamma function and hence find its value.	02	C03	3
v)	Using Beta function evaluate $\int_0^{\frac{\pi}{2}} sin^2\theta cos^3\theta \, d\theta$	02	C03	3
vi)	Evaluate $\int_0^{\pi}\int_0^{a\sin\theta} r dr d\theta$	02	C04	3
vii)	Change the order of integration by expressing it as a single integral $\int_0^1\int_0^y f(x,y)\,dx\,dy + \int_1^2\int_0^{2-y} f(x,y)\,dx\,dy$	02	C04	3
viii)	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 two steps.	02	C06	3
Q.2	**Solve any four questions out of six.**	**16**		
i)	Solve $\frac{dy}{dx} = e^{x-y}(e^x - e^y)$	04	C01	3

ii)	Solve $(D^2 - 3D + 2)y = x^2e^{2x}$	04	C02	3
iii)	Prove that $\int_0^\infty \frac{dx}{(e^x+e^{-x})^n} = \frac{1}{4}\beta\left(\frac{n}{2}, \frac{n}{2}\right)$	04	C03	3
iv)	Find the total length of the curve $x^{2/3} + y^{2/3} = a^{2/3}$	04	C03	3
v)	Evaluate $\int_0^\infty \int_0^\infty e^{-x^2(1+y^2)} x dx dy$	04	C04	3
vi)	Given the following values of e^x, evaluate $\int_0^{2.5} e^x dx$, using Trapezoidal rule.	04	C06	3

X	0	0.5	1	1.5	2	2.5
$y = e^x$	1	1.65	2.72	4.48	7.39	12.18

Q.3	**Solve any two questions out of three.**	**16**		
i)	Solve $\frac{dy}{dx} + (2x \tan^{-1} y - x^3)(1 + y^2) = 0$	08	CO1	3
ii)	Solve by method of variation of parameters, $(D^2 - 1)y = \frac{2}{1+e^x}$	08	CO2	3
iii)	Evaluate $\iint_R xy\, dx\, dy$ over the region R given by $x^2 + y^2 - 2x = 0, y^2 = 2x, y = x$	08	CO4	3
Q.4	**Solve any two questions out of three.**	**16**		
i)	Evaluate $\int_0^{\pi/2} \frac{dx}{a^2 sin^2 x + b^2 cos^2 x}$ and using the rule of differential under integral sign show that $\int_0^{\pi/2} \frac{dx}{(a^2 sin^2 x + b^2 cos^2 x)^2} = \frac{\pi}{4ab}\left(\frac{1}{a^2} + \frac{1}{b^2}\right)$	08	CO3	3
ii)	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
iii)	Use Euler's modified method to find the value of y satisfying the equation $\frac{dy}{dx} = 2 + \sqrt{xy}$, $y(1.2) = 1.6403$ for $x = 1.4$ and $x = 1.6$ correct to four decimal Places by taking $h = 0.2$.	08	CO6	3