University of Mumbai

Program: First Year (All Branches) Engineering

Curriculum Scheme: Rev2019

Examination: FE Semester II

Course Code: _FEC201 Course Name: Engineering Mathematics II

Time: 2 hour 30 minutes Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry TWO marks (20 Marks)**
1.	Particular Integral of DE $(D^3 + 3D^2 - 4)y = e^x$ is
Option A:	$xe^x/9$
Option B:	$xe^x/2$
Option C:	$-xe^x/9$
Option D:	$xe^x/6$
2.	The solution of the differential equation $\left(x + \frac{e^x}{y}\right)dx - \frac{e^x}{y^2}dy = 0$ is
Option A:	$\frac{x^2}{2} + \frac{e^x}{y} = c$
Option B:	$\frac{x^2}{3} + \frac{e^x}{y} = c$
Option C:	$\frac{x^3}{2} + \frac{e^x}{y} = c$
Option D:	$\frac{x^2}{2} + \frac{xe^x}{y} = c$
3.	The value of $\int_0^\infty x^5 e^{-x^2} dx$ is
Option A:	0
Option B:	1
Option C:	1/2

Option D:	π
4.	The value of I = $\int_0^1 \int_x^{\sqrt{x}} (x^2 + y^2) dy\, dx$ is
Option A:	$\frac{3}{35}$
Option B:	$\frac{3}{15}$
Option C:	$\frac{1}{35}$
Option D:	$\frac{3}{5}$
5.	The value of $\int_0^{\pi/2} \int_0^{a\cos\theta} \int_0^{r/\cos\theta} dz\ dr\ d\theta$ is
Option A:	0
Option B:	$\frac{a^2}{8}$
Option C:	$\frac{a^3}{3}$
Option D:	$\frac{a^2}{2}$
6.	The Integrating Factor of DE $(x^2 e^x - my)dx + mx\, dy = 0$ is given by
Option A:	$\frac{1}{y^2}$
Option B:	$\frac{1}{x^2}$
Option C:	$-\frac{1}{y^2}$
Option D:	$-\frac{1}{x^2}$
7.	Find the complementary function of $\frac{d^4y}{dx^4} + \frac{5\,d^2y}{dx^2} + 4 = x\sin x$
Option A:	$y = C_1\cos x + C_2\sin x + C_3\cos 3x + C_4\sin 3x$
Option B:	$y = C_1\cos x + C_2\sin x + C_3\cos 2x + C_4\sin 2x$

Option C:	$y = C_1 \cos xi + C_2 \sin xi + C_3 \cos 2xi + C_4 \sin 2xi$
Option D:	$y = (C_1 + C_2x) \cos x + (C_3 + C_4x) \sin 2x$
8.	Changing the order of integration in double integral $\int_0^2 \int_0^{4-x^2} f(x,y)dydx$ leads to $\int_a^b \int_c^d f(x,y)dxdy$ then value of 'd' is
Option A:	$4 - y$
Option B:	$2 - y$
Option C:	$\sqrt{4 - y}$
Option D:	0
9.	The length of the straight line $y = 2x + 5$ $from$ $x = 1$ to $x = 3$ is given by
Option A:	$\sqrt{5}$ units
Option B:	$3\sqrt{5}$ units
Option C:	$4\sqrt{5}$ units
Option D:	$2\sqrt{5}$ units
10.	Evaluate: $\int_0^{log2} \int_0^x \int_0^{x-y} e^{x+y+z}\, dzdydx$
Option A:	$2\log2 - \frac{5}{4}$
Option B:	$2\log2 + \frac{5}{8}$
Option C:	$\log2 - \frac{5}{4}$
Option D:	$2\log2 - \frac{1}{4}$

Q2.	Solve any Four out of Six (5 marks each) (20 Marks)
A	Solve the DE $(2xy\cos x^2 - 2xy + 1)\,dx + (\sin x^2 - x^2\,)\,dy = 0$
B	Solve $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = \sin(e^x)$
C	Prove that $\int_0^{\infty} \frac{1-\cos ax}{x}\, e^{-x}\, dx = \frac{1}{2}\log(1 + a^2)$, assuming the validity of differentiation under the integral sign.
D	Change the order of integration and evaluate $\int_0^1 \int_{-\sqrt{y}}^{-y^2} xy\, dx\, dy$
E	Evaluate $\int\int\int z\, dz\, dy\, dx$, over the tetrahedron bounded by $x = 0, y = 0, z = 0$ *and* $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1.$
F	Find the length of the cardioid r= a(1-cosθ) lying outside the circle r = acosθ.

Q3.	Solve any Four out of Six 5 marks each (20 Marks)
A	Solve $\tan y \frac{dy}{dx} + \tan x = \cos y \cdot \cos^3 x$
B	Solve the DE $(D^2 - 2D + 1)y = x^2 e^{3x}$, *where* $D \equiv \frac{d}{dx}$
C	Evaluate $\int_0^{\infty} x^2\, 5^{-4x^2} dx$
D	Evaluate the integral $I = \int\int xy\,(x + y)\, dx\, dy$ over the region bounded by the curves $y = x^2$ & $y = x$.
E	Evaluate $\iiint dxdydz$ over the solid of the paraboloid $x^2 + y^2 = 4z$ cut off by the plane z = 4
F	Find the area common to $r = a(1 + \cos\theta)$ & $r = a(1 - \cos\theta)$

Q4.	Solve any Four out of Six 5 marks each (20 Marks)
A	Solve $xy - \frac{dy}{dx} = y^3 e^{-x^2}$
B	Solve $\frac{d^2y}{dx^2} - y = x\sin x + \cos x$
C	Change the order of integration and evaluate $\int_0^1 \int_x^{\sqrt{2-x^2}} \frac{x}{\sqrt{x^2+y^2}}\, dy\, dx$
D	Evaluate $\int_0^{\infty} \frac{x^2}{(1+x^6)^{5/2}}\, dx$
E	Change to polar co-ordinates and evaluate $\int_0^1 \int_0^x x + y\;\; dydx$

F	Solve: $\frac{d^2y}{dx^2} - y = \frac{2}{1+e^x}$, using method of variation of parameters