University of Mumbai
Online Examination 2020

Program: First Year Engineering
Curriculum Scheme: Rev 2012/2016/2019
Examination: First Year Semester II
Course Code: FEC-201 Course Name: Applied Mathematics-II

DISCLAIMER
Below is sample paper only. Any resemblance to any question in final paper is purely coincidental.

Time: 1 hour **Max. Marks: 50**

Q1.	The water under portion of a water tank is divided by horizontal planes one meter apart into the following areas: $472, 398, 302, 198, 116, 60, 34, 12 \; and \; 4 \; sq.m.$ Use the trapezoidal rule to find the volume in cubic meters between the two extreme ends.
Option A:	1385
Option B:	1853
Option C:	1325
Option D:	1883
Q2.	Evaluate $\int_0^{\pi} \frac{sin^2\theta}{5+4\cos\theta} d\theta$ by taking 5 ordinates by Simpson's (1/3) rd rule.
Option A:	0.1146
Option B:	0.4417
Option C:	0.4147
Option D:	0.2345
Q3.	Compute the value of the definite integral $\int_{0.2}^{1.4} (\sin x - \log_e x + e^x) dx$ by Trapezoidal Rule and Simpson's (1/3) rd rule.
Option A:	4.0909 & 3.4949
Option B:	4.071518 & 4.05213
Option C:	4.1417 & 3.9949
Option D:	5.0909 & 7.4949
Q4.	Evaluate $\int_0^1 \int_0^{x^2} e^{\frac{y}{x}} dydx$
Option A:	1/8
Option B:	¼
Option C:	1/6
Option D:	½
Q5.	Evaluate $\int_0^1 \int_{x^2}^{x} xy(x+y) dydx$

Option A:	3/56
Option B:	1/56
Option C:	5/56
Option D:	7/56
Q6.	Evaluate $I = \int_0^{\sqrt{3}} \int_0^{\sqrt{x^2+a^2}} \frac{xdydx}{y^2+x^2+a^2}$
Option A:	$\boldsymbol{I = \frac{\pi a}{8}}$
Option B:	$\boldsymbol{I = \frac{\pi a}{2}}$
Option C:	$\boldsymbol{I = \frac{\pi a}{6}}$
Option D:	$\boldsymbol{I = \frac{\pi a}{4}}$
Q7.	Evaluate $I = \int_0^{\frac{\pi}{4}} \int_0^{\sqrt{\cos 2\theta}} \frac{r}{(1+r^2)^2} drd\theta$
Option A:	$\boldsymbol{I = \frac{\pi}{8}}$
Option B:	$\boldsymbol{I = \frac{(\pi+2)}{8}}$
Option C:	$\boldsymbol{I = \frac{(\pi-2)}{8}}$
Option D:	$\boldsymbol{I = \frac{\pi}{4}}$
Q8.	Find the value of $\int_0^{\infty} xe^{-x^8} dx \int_0^{\infty} x^2 e^{-x^4} dx$
Option A:	$\boldsymbol{\frac{\pi}{\sqrt{2}}}$
Option B:	$\boldsymbol{\frac{\pi}{16\sqrt{2}}}$
Option C:	$\boldsymbol{\frac{\pi}{6\sqrt{2}}}$
Option D:	$\boldsymbol{\frac{\pi}{16}}$
Q9.	Solve $\int_0^{\infty} \frac{e^{-x^3}}{\sqrt{x}} dx \int_0^{\infty} y^4 e^{-y^6} dy$
Option A:	$\boldsymbol{\frac{\pi}{9}}$
Option B:	$\boldsymbol{\frac{\pi}{6}}$
Option C:	$\boldsymbol{\frac{\pi}{3}}$

Option D:	$\frac{\pi}{2}$
Q10.	Evaluate $\int_0^\infty \frac{x^7}{7^x} dx$
Option A:	$\frac{7!}{(\log 7)^7}$
Option B:	$-\frac{7!}{(\log 7)^8}$
Option C:	$\frac{7!}{(\log 7)^8}$
Option D:	$\log 7$
Q11.	Find the value of $2^{2m-1}. \lceil m. \lceil \left(m+\frac{1}{2}\right)$
Option A:	$\sqrt{\pi}\Gamma(m)$
Option B:	$\Gamma(2m)$
Option C:	$\sqrt{\pi}\Gamma(m/2)$
Option D:	$\sqrt{\pi}\Gamma(2m)$
Q12.	Find $\int_0^\infty e^{-ax} \frac{\sin mx}{x} dx$ using DUIS.
Option A:	$\tan^{-1}\left(\frac{a}{m}\right)$
Option B:	$\tan\left(\frac{a}{m}\right)$
Option C:	$\tan\left(\frac{m}{a}\right)$
Option D:	$\tan^{-1}\left(\frac{m}{a}\right)$
Q13.	Find the value of $\int_0^1 \frac{x^\alpha - 1}{\log(x)} dx$
Option A:	$\log(1+\alpha), \alpha < 0$
Option B:	$\log(1-\alpha), \alpha \geq 0$
Option C:	$\log(1+\alpha), \alpha \geq 0$
Option D:	$\log(\alpha), \alpha \geq 0$
Q14.	Find the area bounded by the parabola $y^2 = x$ and the line $y = x$.
Option A:	¼
Option B:	1/6
Option C:	1/5
Option D:	1/3
Q15.	Find the area of the region bounded by $x = 0, y = 0 \; and \; x^2 + y^2 = 1$.

Option A:	$\frac{\pi}{4}$
Option B:	$\frac{\pi}{3}$
Option C:	$\frac{\pi}{2}$
Option D:	$\frac{\pi}{8}$
Q16.	Change the order of integration $\int_0^1 \int_{4y}^4 e^{x^2} dxdy$ and evaluate.
Option A:	$\int_3^2 \int_{2-y}^5 dxdy + \int_2^7 \int_{y-2}^5 dxdy$ and 15
Option B:	$\int_{-3}^2 \int_{2+y}^5 dxdy + \int_2^7 \int_{y+2}^5 dxdy$ and 35
Option C:	$\int_{-3}^2 \int_{2-y}^5 dxdy + \int_2^7 \int_{y-2}^5 dxdy$ and 25
Option D:	$\int_{-3}^3 \int_{2-y}^5 dxdy + \int_2^7 \int_{-5}^5 dxdy$ and 5
Q17.	Evaluate $\int_0^2 \int_1^2 \int_0^{yz} xyzdxdydz$
Option A:	1/4
Option B:	1/3
Option C:	11/4
Option D:	15/2
Q18.	Find $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} \frac{dxdydz}{\sqrt{1-x^2-y^2-z^2}}$
Option A:	$\frac{\pi^2}{3}$
Option B:	$\frac{\pi^2}{6}$
Option C:	$\frac{\pi^2}{8}$
Option D:	$\frac{\pi^2}{9}$
Q19.	Evaluate $\iiint \frac{dxdydz}{(1+x+y+z)^3}$ over the volume of the tetrahedron $x = 0, y = 0, z = 0, x + y + z = 1.$
Option A:	$\frac{1}{4}\left(log2 + \frac{5}{8}\right)$

Option B:	$\frac{1}{2}\left(log2+\frac{5}{8}\right)$
Option C:	$\frac{1}{2}\left(log2-\frac{5}{8}\right)$
Option D:	$\frac{1}{8}\left(log2-\frac{5}{8}\right)$
Q20.	Evaluate $\iiint xyz\,dxdydz$ over the positive octant of the sphere $x^2+y^2+z^2=a^2$.
Option A:	$\boldsymbol{\frac{a^5}{38}}$
Option B:	$\boldsymbol{\frac{a^5}{81}}$
Option C:	$\boldsymbol{\frac{a^5}{18}}$
Option D:	$\boldsymbol{\frac{a^5}{8}}$
Q21.	Find the general solution for the given equation $\frac{d^3y}{dx^3}-6\frac{d^2y}{dx^2}+11\frac{dy}{dx}-6y=0$.
Option A:	$y=C_1e^x+C_2e^{2x}+C_3e^{3x}$
Option B:	$y=C_1e^x+C_3e^{3x}$
Option C:	$y=C_2e^{2x}+e^{3x}$
Option D:	$y=C_1e^x+e^{2x}+e^{3x}$
Q22.	Find the particular integral of $(D^2-4D+3)y=e^{2x}$; where $D=\frac{d}{dx}$
Option A:	$\boldsymbol{-e^{-2x}}$
Option B:	$\boldsymbol{-e^{3x}}$
Option C:	$\boldsymbol{-e^{2x}}$
Option D:	$\boldsymbol{-e^{-2x}+e^{2x}}$
Q23.	Solve the differential equation if $\frac{dy}{dx}=e^{x-y}+x^2e^{-y}$.
Option A:	$e^y=e^x+\frac{x^3}{3}+c$

Option B:	$e^y = e^{-x} + \frac{x^3}{3} + c$
Option C:	$e^{-y} = e^x + \frac{x^3}{3} + c$
Option D:	$e^y = e^x + \frac{x^3}{3} - c$
Q24.	Solve the differential equation$Sec^2x\ tany\ dx + Sec^2y\ tanx\ dy = 0$.
Option A:	$tan\ x\ tan\ y = c$
Option B:	$tany\ Sec\ x = c$
Option C:	$tanx\ Secy = c$
Option D:	$Secx\ Secy = c$
Q25.	Solve the differential equation if $\frac{dy}{dx} = 1 + \tan(y - x)$.
Option A:	$Sin(y - x) = e^{x+c}$
Option B:	$Sin(y + x) = e^{x+c}$
Option C:	$Sin(y - x) = e^{x-c}$
Option D:	$Sin(y + x) = e^{x-c}$