

Dr. B. R. Ambedkar Open University
Faculty of Science, Department of Mathematics
II Year M.Sc. (Mathematics) 2025-26
Course -6, Functional Analysis
Assignment-1

Max Marks: 15

Min. Marks: 6

I. Answer all the following questions.

(5 X 3 = 15 Marks)

1. State and prove Holder's inequality.
2. Every normed linear space can be embedded in a Banach space
3. State and prove Hahn –Banach theorem

Dr. B. R. Ambedkar Open University
Faculty of Science, Department of Mathematics
II Year M.Sc. (Mathematics) 2025-26
Course -6, Functional Analysis
Assignment-2

Max Marks: 15

Min. Marks: 6

I. Answer all the following questions. (5 X 3 = 15 Marks)

1. State and prove the theorem on Gram Schmidt orthonormalization process.
2. (i) State Bessel's inequality.

(ii) State Riesz Fischer theorem
3. State and prove Bessel's inequality

Dr.B.R.Ambedkar Open University
Faculty of Science, Department of Mathematics
II year M.Sc (Mathematics) 2025-26
Course - 7, Complex Analysis
Assignment – 1

Max.Marks:15

Min.Marks:6

I. Answer all the following questions.

(5 X 3 = 15 Marks)

1. Define an analytic function. Derive Cauchy – Riemann equations.
2. Find all possible values of (i) $(1 + i)^{(1+i)}$ (ii) $(i)^{(i)} = 2$.
3. Derive Cauchy's integral formula and evaluate $\int_c \frac{e^{iz}}{z^3} dz$ where C is the circle $|z| = 2$.

Dr.B.R.Ambedkar Open University
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II year M.Sc (Mathematics) 2025-26
Course - 7, Complex Analysis
Assignment – 2

Max.Marks:15

Min.Marks:6

I. Answer all the following questions. (5 X 3 = 15 Marks)

1. State and prove argument principle. Deduce Rouché's theorem.
2. a) Find the singular points and nature of the function $\frac{\cos z}{z^3}$.
b) Find the singularities and residue at each of these singularities of the
function $f(z) = \frac{1}{z^4+1}$.
3. Show that $\int_{-\infty}^{\infty} \frac{x^2}{(x^2+4)^3} dx = \frac{\pi}{64}$

Dr. B. R. Ambedkar Open University
Faculty of Science, Department of Mathematics
II Year M.Sc. (Mathematics) 2025-26
Course – 8A, Commutative Algebra
Assignment-1

Max.Marks :15

Min.Marks : 6

I. Answer all the following questions.

(5 X 3 = 15 Marks)

1. State and prove fundamental theorem for R – module homomorphisms
2. Define the concept of a p – ring and prove that every p – ring is commutative for all primes p .
3. Define the prime spectrum of a ring R and prove that it is a compact and T_0 – space.

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II Year M.Sc. (Mathematics) 2025-26
Course – 8A, Commutative Algebra
Assignment-2

Max.Marks :15

Min.Marks : 6

I. Answer all the following questions. (5 X 3 = 15 Marks)

1. Define Noetherian module and show that an R -module M is Noetherian if and only if every submodule of M is finitely generated.
2. State and prove the Hilbert's Basis theorem. .
3. Prove that every discrete valuation ring is a valuation ring.

Dr. B. R. Ambedkar Open University
Faculty of Science, Department of Mathematics
II Year M.Sc. (Mathematics) 2025-26
Course – 8B, Methods of Applied Mathematics
Assignment-1

Max.Marks :15

Min.Marks : 6

I. Answer all of the following questions:

(5 X 3 =15 Marks)

1. Evaluate $\int_0^a \int_0^{\sqrt{a^2-x^2}} (x^2y + y^3) dydx$ by changing to polar coordinates.
2. Find the area bounded by the cardioid $r = a (1 + \cos \theta)$.
3. Find the volume bounded by the sphere $x^2 + y^2 + z^2 = a^2$.

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II Year M.Sc. (Mathematics) 2025-26
Course – 8B, Methods of Applied Mathematics
Assignment-2

Max.Marks :15

Min.Marks : 6

I. Answer all of the following questions: (5 X 3 =15 Marks)

1. Prove that $xJ'_n(x) = nJ_n(x) - xJ_{n+1}(x)$.
2. Solve the integral equation $y(x) = 1 + x + \int_0^x (x-t)y(t)dt$ ($0 \leq x < +\infty$).
3. State and prove the Quotient law of tensors.

Dr. B. R. Ambedkar Open University
Faculty of Science, Department of Mathematics
II Year M.Sc. (Mathematics) 2025-26
Course – 9A, Measure and Integration
Assignment – 1

Max.Marks :15

Min.Marks : 6

I. Answer all of the following questions: (5 X 3 =15 Marks)

1. Prove that the Lebesgue measure is a countable additive set function on the class $\mathcal{M}$ of Lebesgue measurable sets.
2. State and prove Fatou's lemma and Deduce Lebesgue monotone convergence theorem.
3. State and prove Egorov's theorem.

Dr. B. R. Ambedkar Open University
Faculty of Science, Department of Mathematics
II Year M.Sc. (Mathematics) 2025-26
Course – 9A, Measure and Integration
Assignment – 2

Max.Marks :15

Min.Marks : 6

I. Answer all of the following questions: (5 X 3 =15 Marks)

1. Show that if f is integrable in $[a,b]$ then $F(x) = \int_a^x f(t) dt$ is absolutely continuous on $[a,b]$.
2. State and prove Lebesgue's dominated convergence theorem.
3. State and prove Hahn decomposition theorem.

Dr. B. R. Ambedkar Open University
Faculty of Science, Department of Mathematics
II Year M.Sc. (Mathematics) 2025-26
Course – 9B, Numerical Methods
Assignment-1

Max.Marks :15

Min.Marks : 6

I. Answer all of the following questions: (5 X 3 =15 Marks)

1. The values of x and e^{-x} are given in the following table. Find e^{-x} for $x=1.7489$ by using Stirling's formula.

x	1.72	1.73	1.74	1.75	1.76	1.77	1.78
e^{-x}	0.1790661	0.1772844	0.1755204	0.1737739	0.1720449	0.1703330	0.1686381

2. Derive Newton's interpolation formula.
3. Find the least square approximation by a second-degree polynomial for the following data.

x	-2	-1	0	1	2
$f(x)$	15	1	1	3	19

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II Year M.Sc. (Mathematics) 2025-26
Course – 9B, Numerical Methods
Assignment-2

Max.Marks :15

Min.Marks : 6

I. Answer all of the following questions: (5 X 3 =15 Marks)

1. Solve

$$x_1 + x_2 - x_3 = 2$$

$$2x_1 + 3x_2 + 5x_3 = -3$$

$$3x_1 + 2x_2 - 3x_3 = 6$$

using decomposition method.

2. Using Euler- Maclurin formula, find the value of $\log_e 2$ from $\int_0^1 \frac{dx}{1+x}$.

3. Explain Runge–Kutta fourth order formula. Using it estimate $y(0.1)$ given that

$$\frac{dy}{dx} = y - x, y(0) = 2. \text{ Take } h = 0.1.$$

Dr. B. R. Ambedkar Open University
Faculty of Science, Department of Mathematics
II Year M.Sc. (Mathematics) 2025-26
Course – 10 A & B, Operations Research
Assignment-1

Max.Marks :15

Min.Marks : 6

I. Answer all of the following questions: (5 X 3 =15 Marks)

1. Solve the following LPP using simplex method,

$$\begin{aligned} \text{Max } Z &= 2x_1 + x_2 + x_3 \quad \text{subject to} \\ 4x_1 + 6x_2 + 3x_3 &\leq 8, \quad 3x_1 - 6x_2 - 4x_3 \leq 1, \\ 2x_1 + 3x_2 - 5x_3 &\geq 4; \quad x_1, x_2, x_3 \geq 0. \end{aligned}$$

2. Solve graphically the following LPP:

$$\text{Maximize } Z = 5x_1 + 2x_2$$

subject to the constraints: $4x_1 + x_2 \geq 8, x_1 + x_2 \leq 5, x_1 \geq 0, x_2 \geq 2$.

3. Solve the following system of linear equations, using The Gauss elimination method:

$$2x_1 + x_2 + 4x_3 = 16; 3x_1 + 2x_2 + x_3 = 10; x_1 + 3x_1 + 3x_3 = 16.$$

Faculty of Science, Department of Mathematics
II Year M.Sc. (Mathematics) 2025-26
Course – 10 A & B, Operations Research
Assignment-2

Max.Marks :15

Min.Marks : 6

I. Answer all of the following questions: (5 X 3 =15 Marks)

1. Consider the problem of assigning four jobs J_1, J_2, J_3, J_4 to four machines M_1, M_2, M_3, M_4 . The assignment costs are given below. Determine the optimal assignment schedule:

	<u>Machine</u>			
<i>Job</i>	M_1	M_2	M_3	M_4
J_1	15	14	12	16
J_2	23	22	25	24
J_3	31	34	32	33
J_4	21	32	44	53

2. Consider a situation where the mean arrival rate (λ) is one customer every 4 minutes and the mean service time ($1/\mu$) is 2.5 minutes. Calculate the average number of customers in the system, average queue length, the average time a customer spends in the system and the average time a customer waits before being served.
3. Use Bellman's principle to minimize $Z = y_1 + y_2 + \dots + y_n$ to the constraint $y_1 y_2 \dots y_n = d, y_i > 0$ for $i = 1, 2, \dots, n$.

Dr. B. R. Ambedkar Open University
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II Year M.Sc. (Mathematics) 2025-26
Course -11A, Operator Theory
Assignment-1

Max.Marks :15

Min.Marks : 6

I. Answer all of the following questions: (5 X 3 =15 Marks)

1. Let H be a Hilbert space and let C be a nonempty closed convex subset of H and let x be any vector in H . Then prove that there exists a unique vector $y_0 \in C$ such that $\|x - y_0\| \leq \|x - y\|$ for all $y \in C$.
2. Prove that L_p spaces are complete.
3. State and prove the closed graph theorem.

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II Year M.Sc. (Mathematics) 2025-26
Course -11A, Operator Theory
Assignment-2

Max.Marks :15

Min.Marks : 6

I. Answer all of the following questions: (5 X 3 =15 Marks)

1. State and prove Gelfond-Neumark theorem.
2. State and prove that the Volterra equation of second kind has a unique solution for continuous kernel and $f(x)$.
3. Show that $A(D)$ is a Banach algebra of $C(D)$.