



विश्वजीवनामृतं ज्ञानम्

# Atal Bihari Vajpayee Indian Institute of Information Technology & Management, Gwalior

## IT401: Cloud Computing

Major Examination (Session 2024–25)

Maximum Time: 3 Hours

Max Marks: 68

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*Note: Answer all questions. Assume reasonable data when required and state assumptions clearly.*

1. (a) Draw and explain the **layered architecture** of cloud (service, resource, virtualization, physical). (5)  
(b) Compare **public, private, hybrid, multi-cloud** with one real use-case each. (5) [10]
2. (a) Explain **virtualization models** (full, para, hardware-assisted) with diagrams. (6)  
(b) Discuss challenges in **live VM migration** (downtime, pre-copy/post-copy, dirty pages, network). (4) [10]
3. **Numerical – Capacity & Cost Planning** A web app runs 24×7. Baseline demand is 8 instances (each 2 vCPU, 4 GB). For 6 hours/day, traffic spikes require 20 instances total. Reserved instance (RI) price: 1,800 per instance-month. On-demand: 0.20 per instance-hour. (a) Propose a cost-efficient mix of RI and on-demand using autoscaling. (b) Compute the monthly bill (30 days). (c) Briefly justify trade-offs. [12]
4. **Security & Governance** Explain **zero-trust** for cloud workloads. Propose an architecture using IAM roles, KMS-managed encryption (at rest + in transit), network segmentation, and audit/monitoring. Mention typical **threats** and **mitigations**. [10]
5. **Case Study – Designing a Scalable Analytics Pipeline** A university needs a platform to ingest IoT sensor data from labs (10K devices), store it cheaply, and run nightly analytics plus ad-hoc queries by researchers. Latency for ingestion must be low; analytics can be batch; cost should be minimized. Design a **cloud-native architecture**: ingestion (managed queue/stream), storage tiers (hot/cold), compute (serverless/batch), data catalog, security, and cost controls. Provide a block diagram and justify each choice. [14]

6. **Attempt any two:** (a) Compare **Cloud-native vs. Lift-and-Shift** migrations—impact on cost, reliability, and ops. (6) (b) Explain **serverless event-driven design** with an example workflow. (6) (c) Discuss **SLA/SLO/SLI** in cloud services; give concrete metrics and alerting strategy. (6) [12]