

SCHEME OF VALUATION
(Scoring indicators)

Revision: 2015		Course code: 5011		
Course title: Building maintenance and service				
Qn No.	Scoring indicators	Split up score	Sub total	Total
<u>PART A</u>				
I.1	Define importance of durability <ul style="list-style-type: none"> • Durable building-one lasts for a long time • Provide long period of time to amortize the environmental and economic cost that were incurred in building • Durable products and materials will not need to be replaced frequently • Raw materials , energy and environmental impacts invested can be spread over more time 	2		
I.2	Give classification of maintenance <ul style="list-style-type: none"> • Routine maintenance • Preventive maintenance • Remedial maintenance • Pre monsoon maintenance • Special maintenance 	2		
			10	
I.3	Define corrosion mechanism <ul style="list-style-type: none"> • Corrosion of steel in concrete is an electrochemical process. • One of the two metals (or some part of the metal when only one metal is present) becomes anodic and the other cathodic. • The fundamental chemical changes occurring at the anodic and cathodic areas are as follows: • At anode surface - $\text{Fe} \rightarrow 2\text{e}^- + \text{Fe}^{2+}$ (metallic iron) • At cathode surface - $\frac{1}{2} \text{O}_2 + \text{H}_2\text{O} + 2\text{e}^- \rightarrow 2(\text{OH})^-$ (air) (water) • At anode - $\text{Fe}^{2+} + 2(\text{OH})^- \rightarrow \text{FeO} \cdot (\text{H}_2\text{O})_x$ (rust) 	2		
I.4	List any 4 defects in water supply system (0.5marks each) <ul style="list-style-type: none"> • Rusting • Leakage • Dents & Buckles 	2		

I.5	<ul style="list-style-type: none"> • Blockage • Cracks <p>List any 4 needs for retrofitting (<i>0.5marks each</i>)</p> <ul style="list-style-type: none"> • Increase strength of structure • Increase or restore stiffness • Provide water tightness • Improve durability • Improve functional performance 	2		
PART B				
II.1	<p>List necessity of maintenance(any 4) (<i>6/4 marks each</i>)</p> <ul style="list-style-type: none"> • To preserve the operating condition of machinery and building services, structures etc. • To restore them back to their original standards • To improve the facilities depending upon the development that is taking place in the relevant engineering • To ensure neat appearance and stability of building for a longer period 	6		
II.2	<p>Explain factors for failure of foundation(any 4) (<i>6/4 marks each</i>)</p> <ul style="list-style-type: none"> • Faulty design, improper construction • Unequal settlement, liquefaction of soil • Movement of expansive soil beneath the foundation • Presence of poor soil such as peat • Poor drainage facilities • Landslides etc. 	6		
II.3	<p>Explain effect of fire in building(any 6) (<i>1 marks each</i>)</p> <ul style="list-style-type: none"> • The building contains different materials and on fire they produces different gases • Effects of fire: <ul style="list-style-type: none"> – Carbon monoxide: This gas hampers oxygen from reaching the brain. – Carbon dioxide: This gas over stimulate the rate of breathing and it is responsible for increasing the intake of other toxic gases – Hydrogen sulphide: affects nervous system – Nitrogen dioxide: extremely toxic • Human body can withstand temperature 65-120 c • Smoke hampers vision • Fire victim loses consciousness • Lose clear thoughts 	6		

	<ul style="list-style-type: none"> • Content of oxygen fall from 21 to 17 % in air • Muscle control become difficult • When oxygen level falls below 6% breathing stops and death occur 			
II.4	<p>Explain different defects in sewage system in detail(any 4) (6/4 marks each)</p> <ul style="list-style-type: none"> • Leakage of C.I pipes • Overflowing Cisterns • Blocked Waste Pipes • Blocked drains & drainage • Damaged or cracked China Ware. 	6		
II.5	<p>Requirement of lift(list any 6) (1 marks each)</p> <ul style="list-style-type: none"> • Minimum 1 lift capable of carrying minimum 8 persons weighing 545 kgs. Shall be provided for every high rise building • Landing doors of lifts shall open to ventilated lobby & shall have a fire resistance of 1 hour • 1 lift shall be designed as a "Fire Lift" • "Fireman Switch" shall be provided for each lift. • Lifts shall not be used as means of evacuation. • Collapsible gates shall not be provided for the lift. • If more than 1 lifts are installed the partition wall should be of minimum 2 hours fire resistance. 	6		
II.6	<p>List any 6 methods for repair (1 marks each)</p> <ul style="list-style-type: none"> • Repair using mortars • Dry pack and epoxy bonded dry pack • Pre placed aggregate concrete(PAC) • Shotcrete • Concrete replacement • Epoxy bonded concrete • Silica fume concrete • Ferro cement • Plate bonding • R.C.C jacketing • Foundation rehabilitation methods 	6		
II.7	<p>Briefly explain restoration of heritage building</p> <p>Causes</p> <p>Defects commonly found</p> <p>Repair strategy</p>	2 2 2		42

PART C			
III.a	<p>Explain effect of environmental pollution on durability. Each one with explanation (8/3 marks each)</p> <p>Air pollution Water pollution Pollution of soil</p>	8	15
III.b	<p>Explain economic aspects of maintenance</p> <ul style="list-style-type: none"> • Preparation of budget- 3 type of expenditure • Committed expenditure • Managed expenditure • Variable expenditure 	1 2 2 2	
IV.a	<p>Explain factors affecting life of building (any 6 factors). (8/6 marks each)</p> <ul style="list-style-type: none"> • Type of the structures • Items of work • Specifications of work • Qualities of materials selected and its grade • Usage of machineries • Quality control of work • Occupancy of the buildings • Maintenance of buildings etc; 	8	15
IV.b	<p>Explain factors affecting durability of concrete structures(any 7) (1 marks each)</p> <ul style="list-style-type: none"> • Lack of durability can be caused by external agents arising from the environment or by internal agents within the concrete. • Causes can be categorized as <ul style="list-style-type: none"> • physical, • mechanical • Chemical. • Physical causes arise from the action of frost and from differences between the thermal properties of aggregate and of the cement paste • mechanical causes are associated mainly with abrasion 	7	
V.a	<p>Explain methods for the prevention of corrosion in detail(any 4) (2 marks each)</p> <ul style="list-style-type: none"> • Metallurgical methods • Corrosion inhibitors • Coatings to reinforcement • Cathodic protection • Coatings to concrete etc. 	8	15
V.b	<p>Explain different defects in plastering</p> <ul style="list-style-type: none"> • Blistering, Cracking, Efflorescence, Flaking, Peeling, Popping, Rust stain, Uneven surface etc. <p>Explain remedial measures for the defects.</p>	4 3	

VI.a	<p>Explain different types of failure of structure in detail. (8/6 marks each)</p> <ul style="list-style-type: none"> • Functional • Structural • Aesthetical • Economical • Progressive • Non progressive 	8		
VI.b	<p>Explain causes of defects in wooden structures. 3 causes with explanation. (7/3 marks each)</p> <ul style="list-style-type: none"> • <u>Biological</u> - Fungi (dry rot, wet rot, moulds and others) bacteria; actinomycetes; lichens, mosses and algae wood-boring insect larvae (woodworm, death watch beetle and others) carpet beetle, moths, book lice and silverfish termites • <u>Physical</u> - mechanical abrasion, general handling and others, decomposition by physical agents such as prolonged heating, fire and moisture • <u>Chemical</u> - acids, alkalis and solvents 	7	15	
VII.a	<p>Explain different defects in electrical system in detail.(any 4) (2 marks each)</p> <ul style="list-style-type: none"> • Electrical Service Panel (Main Panel) Defects • Electrical Distribution Panel Defects • Electrical Grounding System Defects • Electrical Wire Defects & Damage 	8		
VII.b	<p>Explain different requirement of gas pipelines (any 7). (1 marks each)</p> <ul style="list-style-type: none"> • The piping system must be designed so that the gas meter provided by gas supplier can be properly located for the building of the owner or each customer • Gas pipes should be located such that the location of isolation valves is easily accessible to the users to facilitate line isolation during emergency. • Each floor or section of a building should be provided with an isolation point, in case of fire or leakage at any of the sections. • Gas pipes should, as far as practicable, be run outside the building, especially when the operating line pressure exceeds 35 kPa • Gas pipes should preferably enter the building aboveground and remain in an aboveground and ventilated location • Gas pipes should be properly painted and labelled for identification purposes. The currently adopted colour for gas pipes is yellow. • The route should avoid any positions where the pipe 	7	15	

	<p>could be liable to damage, either during the building operations or when the property is finally occupied.</p> <ul style="list-style-type: none"> • The fire resistance of the building must not be impaired. • The route should, as far as possible, avoid the need to cut into load-bearing walls or joists. • Pipes may be concealed, but provision should be made for access. Exposed gas pipes would facilitate leak detection and maintenance. • Pipe riser ducts must have fire rated doors and have one side as an external wall with fixed louvers or ventilated p.c. block venting naturally to atmosphere. 			
VIII.a	<p>Explain different defects in sullage system in detail (any 4)</p> <ul style="list-style-type: none"> • Leakage of C.I pipes • Overflowing Cisterns • Blocked Waste Pipes • Blocked drains & drainage • Damaged or cracked China Ware. <p>Suggest the remedial measures</p> <ul style="list-style-type: none"> ➤ Removal of stoppages, cleaning of sewers and other sewer appurtenances and repair work. ➤ Repair for overflowing cistern ➤ Repair for blocked drains etc. 	4		
VIII.b	<p>Explain defects and its causes in drainage system in detail. (any 3, each with explanations) (7/3 marks each)</p> <ul style="list-style-type: none"> • Cracks in clay drains • Roots in sewer clay pipe • Leaking of pipes 	4	15	
IX.a	<p>Classification of underpinning</p> <ul style="list-style-type: none"> • Pit method • Cantilever method • Pile method ➤ sketches 	2 2 2 2		
IX.b	<p>Explain different methods for crack repair in detail (any 3). (7/3 marks each)</p> <ul style="list-style-type: none"> • Routing and sealing • Sealing with epoxy injection • Stitching • External stressing • Autogenous healing etc. 	7	15	

X.a	Define shotcrete Diagram Methods – dry mix and wet mix process Advantages and application	2 1 3 2		
X.b	Explain different methods for restoration of heritage structures (any 3). (7/3 marks each) <ul style="list-style-type: none"> • Strengthening of foundation • Restoration of flooring • Restoration of masonry structure • Restoration steel structure • Restoration timber structure etc. 	7	15	172