Model Question Paper -1 with effect from 2020-21(CBCS Scheme)

USN | | | | | | | | | | |

Fifth Semester B.E. Degree Examination

Naval Architecture

TIME: 03 Hours **Max. Marks: 100**

Note: 01. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.

		Module – 1	
Q.1	(a)	Define: i) Aft Perpendicular, ii) Forward Perpendicular, iii) Length between perpendicular	5 Marks
	(b)	A rectangular double bottom tank 12 m long and 10 m wide is full of sea water. Calculate the head of water above the tank top if the load due to water pressure on the tank top is 9.6 MN.	5 Marks
	(c)	A peak bulkhead is in the form of a triangle, apex down, 6m wide at the top, 9m deep. The tank is filled with sea water. Calculate the load on the bulkhead and the position of the centre of pressure relative to the top of the bulkhead if the water is; a) at the top of the bulkhead b) 4m up the sounding pipe.	10 Marks
		OR	
Q.2	(a)	Explain how simpson's rule can be used to determine area of a plane.	10 Marks
	(b)	The half ordinates of a waterplane 180m long are as follows: section AP ½ 1 2 3 4 5 6 7 8 9 9½ FP ½ ord 0 5.0 8.0 10.5 12.5 13.5 13.5 12.5 11.0 7.5 3.0 1.00 m Calculate: a) Waterplane Area. b) Distance of centroid from midships.	10 Marks
		Module – 2	
Q.3	(a)	Explain with the help of a neat sketch i) Waterplane area coefficient, ii) Block Coefficient, iii) Midship Section Area Coefficient, iv) Prismatic Coefficient	12 Marks
	(b)	A ship 150 m long and 20.5 m beam floats at a draught of 8 m and displaces 19500 tonne. The TPC is 26.5 and midship section area coefficient 0.94. Calculate the block, prismatic and waterplane area coefficient.	08 Marks
		OR	
Q.4	(a)	Explain the following: i) archimidies principle ii) displacement of the ship	07 Marks
	(b)	Explain the effect of suspended mass on centre of gravity.	05 Marks
	(c)	A ship of 8500 tonne displacement is composed of masses of 2000, 3000, 1000, 2000 and 500 tonne at positions 2, 5, 8, 10, and 14 m	08 Marks

		above the keel. Determine the height of the centre of gravity of the ship above the keel.	
		Module – 3	
Q.5	(a)	Explain the following terms with neat diagrams: i) Equillibrium ii) Stable Equillibrium iii) Unstable Equilibrium iv) Neutral Equilibrium	12 Marks
	(b)	A vessel of constant triangular cross-section has a depth of 12 m and a breadth at the deck of 15m. Calculate the draught at which the vessel will become unstable if the centre of gravity is 6.675 m above the keel.	08 Marks
		OR	
Q.6	(a)	Explain the conduction of inclining experiment and hence derive for the height of centre of gravity above the keel.	12 Marks
	(b)	A ship of 6000 tonne displacement has its centre of gravity 5.9 m above the keel and transverse metacentre 6.8 m above the keel. A rectangular double bottom tank 10.5 m long, 12 m wide and 1.2 m deep is now half-filled with sea water. Calculate the metacentric height.	08 Marks
		Module – 4	
Q.7	(a)	Derive an expression for change in mean draught due to change in density.	08 Marks
	(b)	A ship 130m long displaces 14000 tonne when floating at draughts of 7.5m forward and 8.10 m aft. GM_L 125 m, TPC 18, LCF 3 m aft of midships. Calculate the final draughts when a mass of 180 tonne lying 40m aft of midships is removed from the ship.	12 Marks
		OR	
Q.8	(a)	What is residuary resistance? Explain 3 types of residuary resistance.	08 Marks
	(b)	A 6 m model of a ship has a wetted surface area of 8 m^2. When towed at a speed of 3 knots in fresh water the total resistance is found to be 38 N. If the ship is 130 m long, calculate the effective power at the corresponding speed.	12 Marks
		Module – 5	
Q.9	(a)	Define the following terms related to propeller: i) Pitch, ii) Theoretical Speed, iii) Apparent slip, iv) Wake, v) Real slip	10 Marks
	(b)	Define propeller thrust. Obtain an expression for thrust.	05 Marks
	(c)	A ship travels at 14 knots when the propeller, 5 m pitch, turns at 105 rev/min. If the wake fraction is 0.35, calculate the apparent slip and speed of advance.	05 Marks
		OR	
Q.10	(a)	Explain the relation between the various powers affecting the propeller and ship efficiency.	10 Marks
	(b)	Derive an expression for angle of heel considering the effect of rudder force when the ship takes turn.	05 Marks
	(c)	A ship with a metacentric height of 0.4 m has a speed of 21 knots. The centre of gravity is 6.2 m above the keel while the centre of lateral resistance is 4 m above the keel. The rudder is put hard over to port and the vessel turns in a circle 1100 m radius. Calculate the angle to which the ship will heel.	05 Marks

Table showing the Bloom's Taxonomy Level, Course Outcome and Programme Outcome				
Question		Bloom's Taxonomy Level attached	Course Outcome	Programme Outcome
Q.1	(a)	L1	CO1, CO2	PO1, PSO1
	(b)	L3	CO1, CO2	PO2, PSO1
	(c)	L3	CO1, CO2	PO3. PSO1
Q.2	(a)	L2	CO1, CO2	PO1, PSO1
	(b)	L3	CO2	PO4, PSO1
Q.3	(a)	L2	CO3	PO1, PSO1
	(b)	L3	CO3	PO3, PSO1
Q.4	(a)	L2	CO1, CO2	PO1, PSO1
	(b)	L2	CO1, CO2	PO1, PSO1
	(c)	L3	CO2	PO1, PSO1
Q.5	(a)	L2	CO2	PO12, PSO1
	(b)	L3	CO2	PO2, PSO1
Q.6	(a)	L2	CO1, CO2, CO5	PO1, PSO1
	(b)	L3	CO2	PO2, PO3, PSO1
Q.7	(a)	L2	CO2	PO1, PSO1
	(b)	L3	CO2	PO3, PSO1
Q.8	(a)	L2	CO2	PO2, PSO1
	(b)	L3	CO2	PO2, PO3, PSO1
Q.9	(a)	L1	CO4	PO1, PO12, PSO1
	(b)	L2	CO4	PO1, PSO1
	(c)	L3	CO4	PO2, PSO1
Q.10	(a)	L2	CO4	PO1, PSO1
	(b)	L2	CO4, CO5	PO2, PSO1
	(c)	L3	CO4	PO2, PO3, PSO1
Bloom's		Lower order thinking skills		

Taxonomy Levels	Remembering(knowledge): L_1	Understanding Comprehension): L_2	Applying (Application): L_3
	Higher order thinking skills		
	Analyzing (Analysis): L_4	Valuating (Evaluation): L_5	Creating (Synthesis): L_6

Model Question Paper -2 with effect from 2020-21(CBCS Scheme)

USN | | | | | | | | | | |

Fifth Semester B.E. Degree Examination
Naval Architecture

TIME: 03 Hours **Max. Marks: 100**

Note: 02. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.

<table>
<tr><td colspan="3">Module – 1</td><td></td></tr>
<tr><td rowspan="3">Q.1</td><td>(a)</td><td>Define: a) Density, b) Relative Density, c) Centre of Pressure, d) Centroid.</td><td>5 Marks</td></tr>
<tr><td>(b)</td><td>A piece of aluminium has a mass of 300 gm and its volume is 42 cm^3. Calculate: (a) its density in kg/m^3, (b) its relative density.</td><td>5 Marks</td></tr>
<tr><td>(c)</td><td>A rectangular double bottom tank is 20 m long, 12 m wide and 1.5 m deep, and is full of sea water having a density of 1.025tonne/m^3. Calculate the pressure in kN/m^3 and the load in MN on the top and bottom of the tank if the water is:
(a) at the top of the tank
(b) 10 m up the sounding pipe above the tank top.</td><td>10 Marks</td></tr>
<tr><td colspan="3">OR</td><td></td></tr>
<tr><td rowspan="2">Q.2</td><td>(a)</td><td>Explain Simpson’s First Rule in detail.</td><td>10 Marks</td></tr>
<tr><td>(b)</td><td>The half ordinates of a waterplane 120m long are as follows:
<table>
<tr><td>Section</td><td>AP</td><td>0.5</td><td>1</td><td>1.5</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>8.5</td><td>9</td><td>9.5</td><td>FP</td></tr>
<tr><td>$\frac{1}{2}$ Ord. (mtr)</td><td>1.2</td><td>3.5</td><td>5.3</td><td>6.8</td><td>8.0</td><td>8.3</td><td>8.5</td><td>8.5</td><td>8.5</td><td>8.4</td><td>8.2</td><td>7.9</td><td>6.2</td><td>3.5</td><td>0</td></tr>
</table>
Calculate:
a) waterplane area
b) distance of centroid from midships.</td><td>10 Marks</td></tr>
<tr><td colspan="3">Module – 2</td><td></td></tr>
<tr><td rowspan="2">Q.3</td><td>(a)</td><td>Explain with the help of a neat sketch i) Waterplane area coefficient, ii) Block Coefficient, iii) Midship Section Area Coefficient, iv) Prismatic Coefficient</td><td>12 Marks</td></tr>
<tr><td>(b)</td><td>The length of a ship is 18 times the draught, while the breadth is 2.1 times the draught. At the load waterplane, the waterplane area coefficient is 0.83 and the difference between the TPC in sea water and the TPC in fresh water is 0.7. Determine the length of the ship and the TPC in fresh water.</td><td>08 Marks</td></tr>
<tr><td colspan="3">OR</td><td></td></tr>
<tr><td rowspan="2">Q.4</td><td>(a)</td><td>Define TPC and obtain an expression for TPC.</td><td>07 Marks</td></tr>
<tr><td>(b)</td><td>Explain the term ‘centre of gravity’.</td><td>05 Marks</td></tr>
</table>

	(c)	A ship of 10000 tonne displacement has a mass of 60 tonne lying on the deck. A derrick, whose head is 7.5 m above the center of gravity of the mass, is used to place the mass on the tank top 10.5 m below the deck. Calculate the shift in the vessel's center of gravity when the mass is: a) Just clear of the deck b) At the derrick head c) In its final position	08 Marks
		Module – 3	
Q.5	(a)	Explain how metacentric height and transverse metacentre can be determined using an inclining experiment.	12 Marks
	(b)	A ship of 8000 tonne displacement has its centre of gravity 4.5 m above the keel and transverse metacentre 5.0 m above the keel when a rectangular tank 7.5 m long and 15 m wide contains sea water. A mass of 10 tonne is moved 12 m across the deck. Calculate the angle of heel: (a) if there is no free surface of water, (b) if the water does not completely fill the tank.	08 Marks
		OR	
Q.6	(a)	Explain the effect of tank divisions on free surface and derive the reduction in metacentric height for rectangular tank with: No division Mid length, transverse division 1 longitudinal centreline division 2 longitudinal centreline division	12 Marks
	(b)	A vessel of 10000 tonne displacement has a second moment of area of waterplane about the centreline of 60000m. The center of buoyancy is 2.75m above the keel. The following are the disposition of the masses on board the ship: 4000 tonne, 6.30m above the keel. 2000 tonne, 7.5m above the keel. 4000 tonne, 9.15 above the keel. Calculate the metacentric height.	08 Marks
		Module – 4	
Q.7	(a)	Derive an expression for change in trim due to change in density.	08 Marks
	(b)	A ship 150 m long has a draughts of 7.70 m forward and 8.25 m aft,. MCTI cm 250 tonne m, TPC 26 and LCF 1.8 m forward of midships. Calculate the new draughts after the following masses have been added: 50 tonne, 70 m aft of midships 170 tonne, 36 m aft of midships 100 tonne, 5m aft of midships 130 tonne, 4 m forward of midships 40 tonne, 63 m forward of midships	12 Marks
		OR	
Q.8	(a)	Explain about the frictional resistance exerted by the water on the ship.	08 Marks
	(b)	The frictional resistance of a ship in fresh water at 3m/s is 11N/m. The ship has a wetted surface area of 2500m and the frictional resistance is 72% of the total resistance and varies as speed. If the effective power is 1100KW, calculate the speed of the ship.	07 Marks

	(c)	A ship has a wetted surface area of 3200 m^2. Calculate the power required to overcome frictional resistance at 17 knots if n = 1.825 and f = 0.424.	05 Marks
Module – 5			
Q.9	(a)	With the help of a neat diagram explain the relationship between the various speeds in a ship	10 Marks
	(b)	Explain the phenomenon of cavitation and its effects on the ship's propellers	05 Marks
	(c)	A propeller of 4.5m pitch turns at 120rev/min and drives the ship at 15.5 knots. If the wake fraction is 0.30. Calculate i) Apparent Slip, ii) Speed of Advance.	05 Marks
OR			
Q.10	(a)	Explain the relation between the various powers affecting the propeller and ship efficiency.	09 Marks
	(b)	Derive an expression for angle of heel due to force on rudder.	05 Marks
	(c)	A ship of 8000 tonne displacement has a rudder of area 18m^2. The centre of lateral resistance is 4 m above the keel while the centroid of the rudder is 2.35 m above the keel. The maximum rudder angle is 35°. Calculate the angle of heel due to the force on the rudder if the latter is put hard over to port when travelling at 21 knots with a metacentric height of 0.4 m.	06 Marks

Table showing the Bloom's Taxonomy Level, Course Outcome and Programme Outcome				
Question		Bloom's Taxonomy Level attached	Course Outcome	Programme Outcome
Q.1	(a)	L1	CO1	PO1, PSO1
	(b)	L3	CO2	PO2, SO1
	(c)	L3	CO2	PO3, PSO1
Q.2	(a)	L2	CO1	PO1,PSO1
	(b)	L3	CO2	PO3, PO4, PSO1
Q.3	(a)	L2	CO3	PO1, PSO1
	(b)	L3	CO2, CO3	PO2, PO3, PSO1
Q.4	(a)	L2	CO2	PO1, PSO1
	(b)	L2	CO1	PO1, PSO1
	(c)	L3	CO1, CO5	PO2, PSO1
Q.5	(a)	L3	CO1, CO2	PO1, PO3, PSO1
	(b)	L3	CO2	PO3, PSO1
Q.6	(a)	L2	CO1, CO2	PO3, PSO1
	(b)	L3	CO2	PO3, PSO1
Q.7	(a)	L2	CO1, CO2	PO1, PSO1
	(b)	L3	CO2	PO2, PSO1
Q.8	(a)	L2	CO1, CO2	PO1, PSO1
	(b)	L3	CO1, CO2	PO3, PSO1
	(c)	L3	CO1, CO2	PO3, PSO1
Q.9	(a)	L2	CO1, CO4	PO1, PSO1
	(b)	L2	CO1, CO4, CO5	PO2, PSO1
	(c)	L3	CO1, CO4	PO2, PSO1
Q.10	(a)	L2	CO1, CO4	PO1, PSO1
	(b)	L2	CO1, CO4, CO5	PO1, PSO1
	(c)	L3	CO1, CO4, CO5	PO3, PSO1
	Lower order thinking			

Bloom's Taxonomy Levels	skills		
	Remembering(knowledge): $\square_1$	Understanding Comprehension): $\square_2$	Applying (Application): $\square_3$
	Higher order thinking skills		
	Analyzing (Analysis): $\square_4$	Valuating (Evaluation): $\square_5$	Creating (Synthesis): $\square_6$