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IMU CET 2025 Sample Question Paper

Indian Maritime University Common Entrance Test (IMU CET)

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Section II (Sociology)

Group A

10. State whether the following years of enactment are TRUE or FALSE. (1x5=5)

- a) Factories Act → 1944. b) Employees State Insurance Act → 1948.
c) Workmen's Compensation Act → 1923. d) Industrial Disputes Act → 1974.
e) Minimum Wages Act → 1984

11. Match Column A with Column B. (1x10=10)

Column A	Column B
(a) Physiological needs	(a) Recruitment
(b) On the job	(b) Productivity
(c) Asking to apply for a post	(d) Need hierarchy theory
(d) Relation between output and input	(d) Welfare Officer
(e) 500 or more workers	(e) Training
(f) Cost of living index	(f) ESI Act
(g) Medical benefit	(g) Selection
(h) Motivator and Hygiene Factors	(h) Minimum Wages
(i) A method to choose most suitable candidate	(i) Industrial Disputes Act
(j) Conciliation Officer	(j) Two Factor theory of motivation

12. Fill in the blanks. (1x5=5)

- a. Welfare provisions for workers are provided in
b. Funeral expenses amounting to Rs. 10,000/- is payable to the dependents as per
c. Industrial Disputes is defined in
d. Workmen's compensation is payable if personal injury is caused to a workman by accident or of employment.

Group B (Answer any **THREE** from the followings)

13. Write short notes (any **TWO**) (5x2=10)

- a. Ethics b. Value c. Code of conduct d. Justice

14. Write in brief various social problems and their effects in India. (10)

15. Briefly discuss the impact of technology advancement and automation on our society. (10)

16. What is Local Self Government? Discuss its importance. (10)

17. Define and distinguish with example between 'Capitalism' and 'Socialism' (10)

18. Write a note on the 'Constitution of India'. (10)

INDIAN MARITIME UNIVERSITY
(A Central University, Govt.of India)

May/June 2015 End Semester Examinations

SEMESTER – I, B.TECH (MARINE ENGINEERING)

MATHEMATICS - I (T 2102 / T 1102)

Date:09.06.2015

Time:-3 Hrs

Max.Marks:100

Pass Marks:50

PART – A

(3 x10 = 30 Marks)

Compulsory Questions (The Symbols have their usual meanings)

1. a) If $u = \sqrt{xy}$ find the value of $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2}$.
- b) If $u = \sin(ax) + \cos(ax)$ then show that $u_n = a^n [1 + (-1)^n \sin(2ax)]^{\frac{1}{2}}$.
- c) Find the maximum and minimum values of the following function $x^3 + y^3 - 12x - 3y + 15$
- d) Find the radius of curvature at any point (a cost , b sint) of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$
- e) Evaluate $\int_0^\infty e^{-x^2} dx$
- f) Evaluate $\int_0^1 dx \int_0^x e^{\frac{y}{x}} dy$
- g) If $u = x^2 + y^2 + z^2$ and $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$ then find $\text{div} (u \vec{r})$ in terms of u
- h) Find all the solutions of the following system of equations
 $x_1 + 2x_2 - x_3 = 1, 3x_1 - 2x_2 + 2x_3 = 2, 7x_1 - 2x_2 + 3x_3 = 5$
- i) Evaluate $\int_C \frac{z+1}{z^2-2z} dz$, where C is the circle $|z|=5$.
- j) Change the order of integration to evaluate $\int_{y=0}^1 \int_{x=y}^1 e^{x^2} dx dy$

PART – B

(5 x14 = 70 Marks)

(Answer any five of the following)

2. a) If $y = \frac{\log x}{x}$, then prove that $y_n = \frac{(-1)^n n!}{x^{n+1}} (\log x - \sum_{r=1}^n \frac{1}{r})$ (7)
- b) Find the asymptotes to the curve $x^3 - 2y^3 + 2x^2y - xy^2 + xy - y^2 + 1 = 0$ (7)

3. a) If $z = x^n f\left(\frac{y}{x}\right) + y^n \phi\left(\frac{x}{y}\right)$ show that $x^2 \frac{\partial^2 z}{\partial x^2} + 2xy \frac{\partial^2 z}{\partial x \partial y} + y^2 \frac{\partial^2 z}{\partial y^2} + x \frac{\partial z}{\partial x} + y \frac{\partial z}{\partial y} = n^2 z$ (7)

b) Find the minimum value of $u = x^2 + y^2 + z^2$ subject to the condition $ax + by + cz = p$ (7)

4. a) Use the rule of differentiation under the sign of integration to evaluate (7)

$$\int_0^{\frac{\pi}{2}} \log(\alpha \cos^2 \theta + \beta \sin^2 \theta) d\theta$$

b) Evaluate $\iint_R \sqrt{\frac{a^2 b^2 - b^2 x^2 - a^2 y^2}{a^2 b^2 + b^2 x^2 + a^2 y^2}} dx dy$

where R is the region enclosed by the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ in the first quadrant. (7)

5. a) Find the length of an arc of the cycloid $x = a(\theta + \sin \theta)$, $y = a(1 - \cos \theta)$

b) Find the volume and surface area of the solid generated by the revolution of the astroid

$$x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}} \text{ about the x-axis.}$$

(6+8)

6. Find the characteristic equation of the symmetric matrix $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$

Express $A^6 - 6A^5 + 9A^4 - 2A^3 - 12A^2 + 23A - 9I$ in the linear polynomial in A. (14)

7. a) Show that $\vec{v}(x,y,z) = (yz)\hat{i} + (xz)\hat{j} + (xy)\hat{k}$ is irrotational and find a scalar function $u(x,y,z)$ such that $\vec{v} = \text{grad}(u)$. (7)

b) Find the directional derivative of $f(x,y,z) = x^2 yz + 4xz^2$ at the point (1,2,-1) in the direction of the vector $2\hat{i} - \hat{j} - 2\hat{k}$. (7)

8. a) Evaluate the following integral using residue theorem $\int_C \frac{4-3z}{z(z-1)(z-2)} dz$

Where C is the circle $|z| = \frac{3}{2}$. (7)

b) Find the first four terms of the Taylor's series expansion of the complex variable function

$$f(z) = \frac{z+1}{(z-3)(z-4)} \quad (7)$$

9. a) Prove that $\sqrt{\pi} \Gamma(2m) = 2^{2m-1} \Gamma(m) \Gamma(m + \frac{1}{2})$ (7)

b) Test for an extremum of the functional $I[y(x)] = \int_0^1 (xy + y^2 - 2y^2 y') dx$; $y(0) = 1$, $y(1) = 2$ (7)

INDIAN MARITIME UNIVERSITY
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May/June 2015 End Semester Examinations

SEMESTER – I, B.TECH (MARINE ENGINEERING)

BASIC THERMODYNAMICS (T 2103 / T 1103)

Date: 12.06.2015

Time: -3 Hrs

Max. Marks: 100

Pass Marks: 50

PART – A **(3 x 10 = 30 Marks)**
Compulsory Questions

1. a) Define path function & point function?
- b) Define first law of thermodynamics? And write the different types of thermodynamic systems.
- c) What is an equation of state? Write its expression.
- d) Prove $\gamma = 1 + R/C_v$
- e) Name the different types of steam? And explain the dryness fraction.
- f) Define specific volume of steam? Write the enthalpy equation for wet steam.
- g) Define equivalent evaporation?
- h) Define boiler efficiency?
- i) Define mean effective pressure, and air standard cycle efficiency?
- j) Draw the P-V and T-S diagram for the dual cycle?

PART -B

(5x14=70 Marks)

2. In a boiler And turbine plant the steady flow conditions are 3600kg of water per hour enter the boiler at specific enthalpy of 840 kJ/kg and velocity of 300 m/min at 5m elevation. Water receives heat at constant pressure in the boiler and increases the specific enthalpy to 3140 kJ/kg and the steam formed enters the turbine. The steam leaves the turbine at velocity of 3000m/min at an elevation of 1m and specific enthalpy of 2640 kJ/kg. Heat loss from the turbine and the boiler to the surroundings is 72000 kJ/hour. Determine the power output of the turbine?
3. Prove the specific heat relation $(C_p - C_v) = vT\beta^2/k$.

4. Draw the phase equilibrium diagram for a pure substance on T-S plot with relevant constant property lines? Show the isobars on T-S plot, and explain with suitable example.
5. A vessel of volume 0.04 m^3 contains a mixture of saturated water and saturated steam at a temperature of 250°C . The mass of the liquid present is 9 kg. Find the pressure, the mass, the specific volume, the enthalpy, the entropy, and the internal energy.
6. A coal fired boiler plant consumes 400 kg of coal per hour. The boiler evaporates 3200 kg of water at 44.5°C into superheated steam at 12 bar and 274.5°C . If the calorific value of fuel is 32760 kJ/kg of coal, Determine 1. Equivalent evaporation “from and at 100°C ”, 2. Thermal efficiency of the boiler.
7. An air standard dual cycle has a compression ratio of 16, and compression begins at 1 bar, 50°C . The maximum pressure is 70 bar. The heat transferred to air at constant pressure is equal to heat at constant volume.
Estimate (a) the pressure and temperature at the cardinal points of the cycle.
(b) The cycle efficiency and
(c) The M.E.P. of the cycle. $C_v = 0.718 \text{ kJ/kg K}$, $C_p = 1.005 \text{ kJ/kg K}$.
8. A four cylinder diesel engine works on four – stroke cycle has a cylinder bore of 900 mm and a stroke of 150 mm. The crank speed is 370 rpm, and fuel consumption is 15 kg/hr, having a calorific value of 39000 kJ/kg. The indicated mean effective pressure is 5 bar. If the compression ratio is 14 and cut off ratio is 2.3. Calculate the relative efficiency.
Taking $\gamma = 1.4$.

INDIAN MARITIME UNIVERSITY
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May/June 2015 End Semester Examinations

SEMESTER – I, B.TECH (MARINE ENGINEERING)

BASIC ELECTRICAL & ELECTRONICS (T 2104 / T 1104)

Date:16.06.2015

Time:-3 Hrs

Max.Marks:100

Pass Marks:50

PART – A
(Compulsory Questions)

(3 x10 = 30 Marks)

1. a) What is the significance of grouping of cells?
- b) A coil of 1500 turns carries a current of 10 A, establishing a flux of 0.5 mWb.
Find the Inductance of the coil.
- c) An a.c. circuit consists of a pure resistance of 20Ω is connected across 220V (rms),
50 Hz a.c. supply. Calculate:
(I) The current (II) The power consumed (III) The equation for the voltage.
- d) Why is damping torque necessary in a sensitive analog indicating instrument? What
would happen in the absence of damping torque?
- e) What is a transducer? Give three examples
- f) As regard electrical cables, what is an insulator? Why plastic is not used as an insulator
on board?
- g) Why P-N junction Diode does not work when connected in reverse biased mode?
- h) What is the special feature of a Zener diode? Draw Zener diode characteristic curve
and label it.
- i) The reverse saturation current of an NPN transistor in common-base circuit is $12.5 \mu\text{A}$.
For an emitter current of 2mA, collector Current is 1.97mA.
Determine the current gain and base current.
- j) With respect to a junction transistor, what is current gain?

PART – B
(Answer any five of the following)

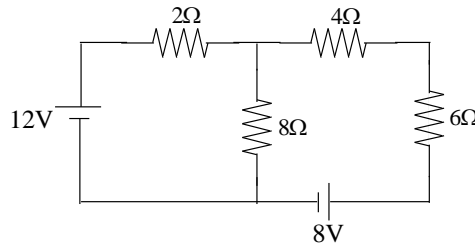
(5 x14 = 70 Marks)

2. a) How will you Thevenize a given circuit? Write step wise.

b) Using Kirchhoff's laws find

(i) The current in 6Ω resistance

(ii) Voltage drop across 8Ω resistance



(6+8)

3. a) What is the purpose of metallic core in an electrical device? Draw a simple magnetic circuit and show leakage flux, useful flux and fringing. What is Hopkinson's leakage coefficient? How can you minimize the leakage flux? **(1+3+2+1)**

b) An air cored solenoid has 400 turns, its length is 30 cm and it has a cross-sectional area of 5 cm^2 . Calculate its self-inductance. **(7)**

4. a) Prove that in a 3Φ Star connected balanced system the algebraic sum of the three phase e.m.f is zero i.e., $e_1 + e_2 + e_3 = 0$

b) A coil of resistance 20Ω and an inductance of 60 mH is connected in series with a $130\mu\text{F}$ capacitor across a 230 V, 50 Hz supply.

Calculate: (i) The Impedance

(ii) The power factor of the circuit

(iii) The current flowing in it

(iv) Voltage across the inductance of the coil

(v) The voltage across the capacitor.

(4+10)

5. a) With a neat sketch explain the construction and working of a moving iron type ammeter. Can we use eddy current damping for this type of instrument? Justify your answer. **(5+2)**

b) How will you use a P.M.M.C. instrument which gives full scale deflection at 50 mV and 10 mA current, as **(7)**

(i) Ammeter 0-10A range

(ii) As voltmeter 0-250 V range.

6. a) A dynamometer type wattmeter with its voltage coil connected across the load side of the instrument, reads 250 watts. If the Load voltage be 200 v, what power is being taken by load? The voltage coil branch has a resistance of $2,000\Omega$.
Also show the connection. (7)
- b) The arms of an A.C. Maxwell bridge are arranged as follows: AB is a non-inductive resistance of 1000Ω in parallel with a Capacitor of capacitance $0.3\mu F$, BC is a non-inductive resistance of 500Ω , CD is inductive impedance (unknown) and arm DA is a non-inductive resistance of 800Ω . If balance is obtained under these conditions, find the value of the resistance and the inductance of the branch CD. (7)
7. (i) What is Photo electric effect?
- (ii) Write short note on Thermionic emission and their applications.
- (iii) "When a P-N junction is formed, diffusion current causes barrier potential"
Justify the statement with the help of labeled sketch. (4+4+6)
8. a) Enumerate the conditions for proper working of a Zener diode? Draw a circuit diagram suitable for its proper functioning give three applications of a Zener diode
- b) What is a rectifier? How many minimum numbers of diode you will require for full wave rectification in single phase circuit? Draw one such circuit, label it and explain its working. In your circuit include a filter. What is the role of the filter in the circuit? (6+8)
9. What is a transistor? What are the three modes in which the transistors are operated? Draw the circuits. Explain with a simple Circuit how a NPN transistor works. How a transistor amplifies current? (1+3+6+4)

INDIAN MARITIME UNIVERSITY
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May/June 2015 End Semester Examinations

SEMESTER – I, B.TECH (MARINE ENGINEERING)

ENGINEERING MECHANICS - I (T 2105 / T 1105)

Date:19.06.2015
Time:-3 Hrs

Max.Marks:100
Pass Marks:50

PART – A
Compulsory Questions

(3 x10 = 30 Marks)

1. a) Explain a truss and a frame with a diagram.
- b) Explain centre of gravity and centre of mass.
- c) Explain Super Elevation or Banking of roads.
- d) What is moment of Inertia and radius of gyration?
- e) What is Free Body Diagram?
- f) What is D'Alembert's principle?
- g) Explain Lami's theorem.
- h) What is statically indeterminate Structure?
- i) Explain radial and tangential components of acceleration.
- j) Explain the condition of equilibrium in a system of coplanar forces?

PART – B
(Answer any five of the following)

(5 x14 = 70 Marks)

2. The position of a particle moving along a straight line is given by the relation $X = 30t^3 - 5t^2 - 10t + 10$, where X is expressed as m and t in seconds. Determine:
 - a) The time at which the velocity will be zero. **(4)**
 - b) The position and distance traveled by the particle at that time. **(4)**
 - c) The acceleration of the particle at that time. **(2)**
 - d) The distance traveled by the particle in 2 s and 9 s. **(4)**

3. Two masses A and B having 80 Kg and 200 Kg respectively are suspended by a rope over a smooth pulley. Find the tension in the rope and the acceleration of the system. (14)

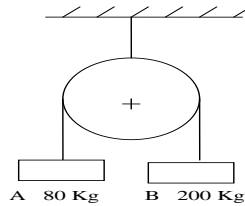
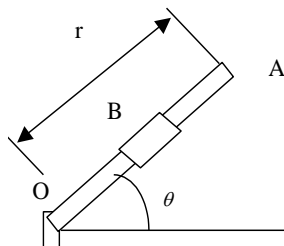


Fig. 2

4. Two trains A and B are moving in the same direction along parallel lines. The train A is moving with uniform speed of 72 km/hr and 150 m behind the train B. The train B started from the station with uniform acceleration of 1 m/s^2 . Show that the trains A and B will meet each other twice and find their speeds when this happens. (14)
5. The rotation of rod OA about O is defined by the relation $\theta = 3.0 t^2$, where θ is expressed in radians and t in seconds. Collar B slides along the rod in such a way that distance from O is $r = 100 t^2 - 20 t^3$, where r is expressed in mm and t in seconds. When $t = 3.0$ determine the velocity of the collar. (14)



6. Determine the centroid of the plane area bounded by the curve $y = 16x^2$ between the points (0, 0) and (1, 16) and the x-axis. (14)
7. Determine the moment of Inertia for a circular lamina with radius 100 cm about the diametral axis. (14)
8. A projectile is fired from the edge of a 151 m high cliff with an initial velocity of 181 m/s at an angle of 31° with the horizontal. Find the greatest elevation above the ground level reached by the projectile and the horizontal distance from the gun to the point where the projectile strikes the ground. (14)
9. Three vectors \vec{A} , \vec{B} and \vec{C} are as given below. Find the resultant and the direction of unit vector along the resultant.

$$\vec{A} = \vec{i} + \vec{j} - 2\vec{k}, \vec{B} = 4\vec{i} + 3\vec{j} - 2\vec{k}, \vec{C} = 2\vec{i} + \vec{j} + \vec{k} \quad (14)$$

INDIAN MARITIME UNIVERSITY
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May/June 2015 End Semester Examinations

SEMESTER – I, B.TECH (MARINE ENGINEERING)

WORKSHOP TECHNOLOGY (T 2106 / T 1106)

Date:23.06.2015

Time:-3 Hrs

Max.Marks:100

Pass Marks:50

Note : (i) Non- Programmable scientific calculator is allowed

(ii) Attempt **six** questions

(iii) Question no.1 is **compulsory**

PART – A
Compulsory Questions

(3 x10 = 30 Marks)

1. a) What is grindability?
- b) Define the term Reaming.
- c) Define Weldability.
- d) Draw a neat sketch of twist drill, mentioning its parts.
- e) Draw any three Moulding tools.
- f) Draw a simple sketch of Blow down cock.
- g) Differentiate between a file and a scraper.
- h) What is spot facing?
- i) Write short notes on: (i) Soldering (ii) Brazing.
- j) What do you mean by packing? List any two packing materials.

PART – B
(Answer any five of the following)

(5 x14 = 70 Marks)

2. a) Draw neat sketches of any four types of files used. **(8)**
- b) Sketch and explain Dial Indicator Mechanism. **(6)**

3. a) List various types of chip breakers. Describe their uses. (7)
b) Enlist various types of cutting tool failures with diagram. (7)
4. a) Describe and sketch the following (9)
i) Hermaphrodite caliper ii) Spring caliper iii) Depth gauge
b) Define Pattern makers scale. What do you understand by interchangeability. (5)
5. a) Draw and label the parts of a Lathe Machine. (10)
b) Differentiate between Turret and Capstan lathe machine (4)
6. a) Describe various types of packing & jointing materials.
State the material used for high pr. steam and Sea water. Give reason. (8)
b) Explain any one type of jig and one fixture with neat sketch. (6)
7. Define gas welding. Explain Oxy-acetylene gas welding with a neat sketch.
Also draw a neat labeled sketch of Oxy-acetylene gas welding equipment. (14)
8. a) Briefly explain causes of accident. (6)
b) Write short note on Factory Act (4)
c) Write a short note on PPE (Personal Protective Equipment) (4)
