BTS – IV(SS) – 09.14 – 0652 Reg. No. | | | | | | | | |

A

B.Tech. Degree IV Semester Special Supplementary Examination September 2014

IT/CS/CE/SE/ME//EE//EC/EB/EI/FT 1401 ENGINEERING MATHEMATICS III

(2012 Scheme)

Time : 3 Hours Maximum Marks : 100

PART A

(Answer *ALL* questions)

$(8 \times 5 = 40)$

I. (a) Show that the real and imaginary parts of an analytic function form an orthogonal system.

(b) Show that the transformation $w = \frac{2z+3}{z-4}$ changes the circle $x^2 + y^2 - 4x = 0$ into a straight line $4u + 3 = 0$.

(c) Find the poles and residues of the function $f(Z) = \frac{z^2 - 2z}{(z+1)^2 (z^2+1)}$.

(d) Evaluate $\int_{-\infty}^{\infty} \frac{x^2}{(X^2 + a^2)^3} dx$.

(e) Form the partial differential equation by eliminating the arbitrary function from $F(xy + z^2, x + y + z) = 0$.

(f) Solve $p + q = pq$.

(g) Derive one dimensional heat equation.

(h) Solve one dimensional wave equation.

PART B

$(4 \times 15 = 60)$

II. (a) If $u - v = (x-y)(x^2 + 4xy + y^2)$ and $f(z) = u + iv$ is an analytic function of $z = x + iy$ find $f(z)$ in terms of z. (9)

(b) Show that an analytic function with a constant modulus is constant. (6)

OR

III. (a) Discuss the mapping properties of $w = Cos\ z$. (8)

(b) Show that $w = z^2$ maps the circle $|z-1| = 1$ into the cardiod $\rho = 2(1 + \cos\phi)$. (7)

(P.T.O.)

IV. (a) Evaluate $\int_{|z|=3} \frac{e^z}{(z+2)(z+1)^2} dz$ (7)

(b) Expand $f(z) = \frac{z}{(z^2-1)(z^2+4)}$ in the region

$|z|<1$ (ii) $1<|z|<2$, (iii) $|z|>2$ (8)

OR

V. (a) Show that $\int_0^{2\pi} \frac{d\theta}{(5-3\cos\theta)^2} = \frac{5\pi}{32}$. (7)

(b) Show that $\int_0^{\infty} \frac{\sin mx}{x} dx = \frac{\pi}{2}$ (8)

VI. Solve (3 × 5 = 15)

(i) $(x^2-y^2-z^2)p+2xyq=2xz.$

(ii) $z^2(p^2+q^2+1)=a^2$

(iii) $z^2(p^2+q^2)=x^2+y^2$

OR

VII. Solve (3 × 5 = 15)

(i) $(D^2+4DD'-5D'^2)z=\sin(2x+3y)$

(ii) $(D^2+3DD'+2D'^2)z=5xy$

(iii) $(4D^2+12DD'+9D'^2)z=e^{3x-2y}$

VIII. (a) A tightly stretched string with fixed end points $x=0$ and $x=1$ is initially in a position given by $y=y_0 Sin^3\left(\frac{\pi x}{l}\right)$. If it is released from rest from this position find the displacement $y(x,t)$. (10)

(b) Solve using method of separation of variables (5)

$$\frac{\partial^2 z}{\partial x^2} - 2\frac{\partial z}{\partial x} + \frac{\partial z}{\partial y} = 0$$

OR

IX. (a) Obtain D' Alembert's solution of wave equation. (7)

(b) An insulated rod of length l has its ends A and B maintained at 0°C and 100°C respectively until steady state conditions prevail. If B is suddenly reduced to 0°C and maintained at 0°C, find the temperature at a distance x from A at a time t. (8)

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C

B.Tech. Degree IV Semester Special Supplementary Examination September 2014

ME 1402 METROLOGY AND INSTRUMENTATION

(2012 Scheme)

Time : 3 Hours Maximum Marks : 100

PART A

(Answer *ALL* questions)

(8 x 5 =40)

I. (a) Mention the differences between line standards and end standards.

(b) Differentiate the following:

(i) Hole basis system and shaft basis system. (ii) Tolerance and allowances.

(c) Outline the CLA method of assessment of surface finish.

(d) Explain the importance of an optical flat.

(e) Distinguish between active and passive transducer.

(f) Differentiate between static characteristics and dynamic characteristics.

(g) Define load cells. What are the types of load cells?

(h) Explain microphones.

PART B

(4 x 15 = 60)

II. (a) Explain different types of errors in measurement. (10)

(b) Explain the wringing procedure of slip gauges with neat sketch. (5)

OR

III. (a) Explain different types of fits with neat sketches. (10)

(b) Explain what is meant by interchangeability and selective assembly. (5)

IV. (a) Describe the working of an autocollimator with the help of a neat sketch. (10)

(b) Write a short note on spirit level. (5)

OR

V. Explain the working principles of the following interferometers with the help of a neat sketch (15)

(i) NPL flatness type interferometer

(ii) Laser beam interferometer.

VI. (a) Explain the generalized measurement systems with block diagrams. Give an example. (10)

(b) Define the following terms: (5)

(i) Sensitivity

(ii) Hysteresis

OR

(P.T.O.)

VII.	(a)	Discuss briefly the generalized input - output configuration of a measurement system.	(10)
	(b)	Explain any two methods for correction of spurious inputs in an instrument.	(5)
VIII.	(a)	With a neat sketch explain Heenan and Froude hydraulic dynamometer.	(8)
	(b)	Explain the working of optical pyrometer.	(7)

OR

IX.	Explain the following: (i) Gas chromatography (ii) Scintillation counter (iii) Sound level meter	(15)

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B

B.Tech. Degree IV Semester Special Supplementary Examination September 2014

ME 1403 MECHATRONICS

(2012 Scheme)

Time : 3 Hours Maximum Marks : 100

PART A

(Answer *ALL* questions)

(8 x 5 = 40)

I. (a) Discuss about a closed loop system with an example.

(b) An electrical resistance of a strain gauge with a resistance of 100 Ω and gauge factor 2.0. What is the change in resistance of the gauge when it is subjected to a strain of 0.001?

(c) What are the basic building blocks of a thermal system?

(d) With the help of an example explain the ON-OFF controller.

(e) By Routh stability criterion determine the stability of the system represented by the characteristic equation,

$9s^5 - 20s^4 + 10s^3 + s^2 - 9s - 10 = 0$. Comment on the location of roots of characteristic equation.

(f) Explain gain margin and phase margin with its significance.

(g) Construct a AND gate using NAND gate.

(h) Write a note on tactile sensing with an example for tactile sensor.

PART B

(4 x 15 = 60)

II. (a) A 3 bit encoder is used for measuring angular displacement. What would be the smallest angle that can be accurately measured using the same? (5)

(b) Discuss on any 5 static performance characteristics of a transducer. (10)

OR

III. (a) The resistance of the metal used in Resistance Temperature Detector (RTD) changes based on the equation $R_t = R_o(1+\alpha t)$, where 't' is the temperature in ^0C, 'R_t' is the resistance in ohms at '$t\,^0C$', R_0 is the resistance in ohms at 0^0C and α is the temperature coefficient of resistance. If the resistance at 25^0C was found to be 300Ω & at 65^0C is 325Ω, find the resistance at 110^0C. (5)

(b) Describe about obstructive type and reflective type optical sensors with neat sketches. (10)

IV. Explain P, PI, PD, PID controller and sketch their characteristics. Also determine each of its transfer function. (15)

OR

V. The open loop transfer function of a unity feedback control system is given by $G(s) = \dfrac{100}{s(s+2)(s+5)}$. For unit step input, find the time response of closed loop system. Determine % overshoot, rise time, peak time and settling time. (15)

(P.T.O.)

VI. Plot the Bode diagram for the following transfer function and obtain the gain and phase cross over frequencies $G(s) = \dfrac{20}{s(1+3s)(1+4s)}$. (15)

OR

VII. Sketch root locus for the unity feedback system whose open loop transfer function is, $G(s)H(s) = \dfrac{K(s+15)}{s(s+1)(s+5)}$. (15)

VIII. (a) Liquid in a container is to be mixed thoroughly using mixer which is to be operated by an input push button switch A and it is to operate for 15 seconds. Then it is to be heated to a temperature of 300^0C and then it is stopped. Assume that there exists a temperature sensor to monitor the temperature of the liquid. Draw the ladder logic diagram for the given situation. (5)

(b) Draw and explain the internal architecture of a micro-controller. (10)

OR

IX. (a) One bit binary data has to be compared with another one bit data. Suggest an appropriate gate which gives an output (high) when the bits are not equal. (5)

(b) With a neat sketch explain a car engine management system. (10)

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A

B. Tech. Degree IV Semester Special Supplementary Examination September 2014

ME 1404 APPLIED THERMODYNAMICS

(*2012 Scheme*)

Time: 3 Hours Maximum Marks: 100

PART A

(Answer *ALL* questions)

I. (a) What is a quasi-equilibrium process? What is its importance in engineering? (8 x 5 = 40)

(b) What is the difference between a refrigerator and a heat pump?

(c) What is the difference between the critical point and the triple point?

(d) What four processes make up the simple ideal Rankine cycle?

(e) What do you understand by super saturation of steam flowing through nozzles? Explain the phenomenon and factors responsible for it.

(f) Describe the velocity diagram for single stage impulse turbine.

(g) Express Amagat's law of additive volumes. Does this law hold exactly for ideal-gas mixtures?

(h) Consider a gas mixture that consists of 3 kg of O_2, 5 kg of N_2 and 12 kg of CH_4. Determine the mole fraction of each component.

PART B

(4 x 15=60)

II. A Carnot heat engine receives heat from a reservoir at 900°C at a rate of 800 kJ/min and rejects the waste heat to the ambient air at 27°C. The entire work output of the heat engine is used to drive a refrigerator that removes heat from the refrigerated space at – 5°C and transfers it to the same ambient air at 27°C. Determine (i) the maximum rate of heat removal from the refrigerated space (ii) the total rate of heat rejection to the ambient air. (15)

OR

III. (a) Define 'available energy' and 'unavailable energy'. (6)

(b) What are Maxwell relations? Discuss their significance. (9)

IV. Consider a 210 MW steam power plant that operates on a simple ideal Rankine cycle. Steam enters the turbine at 10 MPa and 500°C and is cooled in the condenser at a pressure of 10kPa. Show the cycle on a T-s diagram with respect to saturation lines, and determine (i) the quality of the steam at the turbine exit (ii) the thermal efficiency of the cycle, (iii) the mass flow rate of the steam. Assume an isentropic efficiency of 85 percent for both the turbine and the pump. (15)

OR

V. Steam is generated in a boiler at 30 bar 300°C at the rate of 11 kg/s with feed water entering economizer at 100°C. During one hour test 5000 kg fuel is used in boiler. Calorific value of fuel is 35000 kJ/kg. For the feed water being supplied to boiler to be at 27°C determine: (15)

(i) the equivalent evaporation per kg of fuel

(ii) the boiler efficiency

(iii) the percentage of fuel energy utilized in economizer

(P.T.O.)

VI. Prove that the maximum discharge of fluid per unit area through a nozzle shall occur when the ratio of fluid pressure at throat to the inlet pressure is $\left(\frac{2}{n+1}\right)^{\frac{n}{n-1}}$ where 'n' is the index of adiabatic expansion. Also obtain the expression for maximum mass flow through a convergent-divergent nozzle having isentropic expansion starting from rest. (15)

OR

VII. In a single stage impulse turbine the isentropic enthalpy drop of 200 kJ/kg occurs in the nozzle having efficiency of 96% and nozzle angle of 15°. The blade velocity coefficient is 0.96 and ratio of blade speed to steam velocity is 0.5. The steam mass flow rate is 20 kg/s and velocity of steam entering is 50 m/s. Determine: (15)

(i) the blade angles at inlet and outlet if the steam enters blades smoothly and leaves axially.
(ii) the blade efficiency
(iii) the power developed in kW
(iv) the axial thrust

Solve using velocity diagram

VIII. A vessel contains at 1 bar and 20°C a mixture of 1 mole of CO_2 and 4 moles of air. Calculate for the mixture: (15)

(i) The masses of CO_2, O_2 and N_2 and the total mass
(ii) The percentage carbon content by mass
(iii) The apparent molecular weight and the gas constant for the mixture
(iv) The specific volume of the mixture

The volumetric analysis of air can be taken as 21% oxygen and 79% nitrogen.

OR

IX. An insulated vessel containing 1 mole of oxygen at a pressure of 2.5 bar and a temperature of 293 K is connected through a valve to a second insulated rigid vessel containing 2 mole nitrogen at a pressure of 1.5 bar and a temperature of 301 K. The valve is opened and adiabatic mixing takes place. Assuming that oxygen and nitrogen are perfect gases calculate the entropy change in the mixing process. (15)

Assume the following specific heats at constant volume

$C_{v(O2)} = 0.39\ kJ/kg\ K,\ C_{v(N2)} = 0.446\ kJ/kg\ K$

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D

B.Tech. Degree IV Semester Special Supplementary Examination September 2014

ME 1405 HYDRAULIC MACHINERY

(2012 Scheme)

Time : 3 Hours Maximum Marks : 100

PART A

(Answer *ALL* questions)

(8 × 5 = 40)

I. (a) Write a note on Rayleigh's method of dimensional analysis.

(b) What are distorted models? What are the reason of constructing such models for rivers?

(c) Give the comparison between the impulse and reaction turbines.

(d) What is the importance of draft tube in reaction turbines?

(e) How does the specific speed of a centrifugal pump differ from that of a turbine?

(f) Describe the use of air vessels in a reciprocating pump.

(g) Explain the working of a hydraulic ram.

(h) Explain the use of gear pump with a neat sketch.

PART B

(4 × 15 = 60)

II. (a) Using the method of dimensional analysis obtain an expression for the discharge Q over a rectangular weir. The discharge depends on the head H over the weir, acceleration due to gravity g, length of weir crest L, height of the weir crest over the channel bottom Z and the kinematic viscosity Y of the liquid. (10)

(b) A ship model of scale 1/60 is towed through sea water at a speed of 5m/sec. A force of 6N is required to tow the model. Determine the speed of ship and the propulsive force on the ship. Assume the ship is subjected to wave resistance only. (5)

OR

III. (a) State Buckingham's π theorem. How are the repeating variables selected for Buckingham method? (6)

(b) A 1/30 model of a naval ship having a submerged area (A) of $7m^2$ and length 10 meters has a total drag of 25N when towed through water at velocity(V) of 2m/sec. Calculate total drag on the prototype when moving at the corresponding speed. Use the relation $F_f = k\rho AV^2$ for calculating the skin resistance (Where $k = 0.04/(Re)^{0.2}$, Re denotes Reynolds number). Take kinematic viscosity of water (or sea water) as 0.01 stoke and density (ρ) of water (or sea water) as $1000kg/m^3$. (9)

(P.T.O.)

IV. (a) Prove that in an impulse turbine with outlet vane angle ϕ, have maximum hydraulic efficiency $\eta_h = \frac{1+\cos\phi}{2}$. (8)

(b) A Kaplan turbine runner is to be designed to develop 8500kW shaft power. The net available head is 6m. Assume that the speed ratio is 2.5 and flow ratio is 0.7, and the overall efficiency is 65%. The diameter of the runner is 4 times the boss diameter. Find the diameter and speed of the runner and specific speed of the turbine. (7)

OR

V. (a) Write a note on axial flow reaction turbine with a neat sketch. (7)

(b) A Pelton wheel has to be designed for the following data: (8)

Power to be developed	=	6MW
Net head available	=	300m
Ratio of jet diameter to wheel diameter	=	1/10
Speed	=	550rpm
Overall efficiency	=	85%

Find the number of jets required, diameter of jet, diameter of wheel and quantity of water required (assume Cv = 0.98, speed ratio Ku = 0.46).

VI. (a) A centrifugal pump is running at 900 rpm is working against a total head of 22m. The external diameter of the impeller is 450mm and outlet width 50mm. If the vane angle at outlet is 45° and manometric efficiency is 65% determine flow velocity at outlet, absolute velocity of water leaving the vane, angle made by the outlet absolute velocity with the direction of motion and rate of flow through the pump. (9)

(b) What is maximum suction lift of a centrifugal pump? (6)

OR

VII. (a) A single acting reciprocating pump has a piston diameter of 150mm and stroke length 300mm. The length and diameter of the suction pipe are 8m and 60mm respectively if the suction lift of the pump is 3.2m and separation occurs when pressure in the pump falls below 2.5m of water absolute and the manometer reads 765mm of mercury, find the maximum speed at which pump can be run without separation in the suction pipe. (8)

(b) Obtain an expression for the pressure head in the suction and delivery pipes due to acceleration of piston in a reciprocating pump. (7)

VIII. (a) The efficiency of a hydraulic crane, which is supplied water under a pressure of 100N/cm^2 for lifting a weight through a height of 15m, is 65%. If the diameter of the ram is 200mm and velocity ratio 5, find the weight lifted by the crane and the volume of water required to lift the weight. (9)

(b) Write down the working principle of hydraulic accumulator with neat sketch. (6)

OR

IX. Write notes on: (15)

(i) Hydraulic intensifier
(ii) Hydraulic press
(iii) Surge tank

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B

B.Tech. Degree IV Semester Special Supplementary Examination September 2014

ME 1406 MANUFACTURING PROCESS

(2012 Scheme)

Time : 3 Hours Maximum Marks : 100

PART A

(Answer *ALL* questions)

(8 x 5 = 40)

I. (a) What are the properties of moulding sand?

(b) Explain "gating system" with neat sketch.

(c) Enumerate the characteristics of sand coatings.

(d) Explain gravity die casting.

(e) Briefly explain the process of spinning.

(f) What do you mean by hot rolling? Explain.

(g) Compare the processes, welding, soldering and brazing.

(h) Explain electron beam welding.

PART B

(4 x 15 = 60)

II. What are the chief constituents of moulding sand? Explain their importance.

OR

III. Explain with neat sketch, any five types of patterns.

IV. What are the predesign considerations in the design of castings? Explain each in detail.

OR

V. Describe 'casting defects'. Explain eight common casting defects, in detail.

VI. Explain the process of hot working with suitable examples. What are its advantages and disadvantages?

OR

VII. Describe the forging process. What are its advantages and limitations?

VIII. What is meant by "weld defects"? List down five major defects and explain them with their causes.

OR

IX. Which are the components of a conventional gas welding equipment? With neat diagrams, explain them.

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