G 7152 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, APRIL 2011

Fifth Semester

Branch—Mechanical/Automobile Engineering

THERMAL ENGINEERING—I (M, U)

(Supplementary)

Time : Three Hours Maximum : 100 Marks

Use of Mollier diagrams and Steam tables are permitted.

Part A

Answer **all** *questions.*
Each question carries 4 *marks.*

1. What is Supercritical steam cycle ?
2. What is a back pressure turbine ? What are its applications ?
3. What do you understand by super saturated flow ?
4. Why are steam turbine compounded ? What are the different methods of compounding ?
5. Bring out the difference between the closed cycle and open cycle gas turbine power plants ?
6. What are the basic parameters that influence flame speed ?
7. What are the functions of solar concentrators and solar receivers ?
8. Explain how will you define the efficiency of a solar collector.
9. How are Pulverizers classified ?
10. What is a Stocker ? What are the different types of stokers ?

(10 × 4 = 40 marks)

Part B

Each question carries 12 *marks.*

11. (a) What do you understand by externally irreversible and internally irreversible Rankine cycle ? (6 marks)

    (b) Explain the different methods by which the mean temperature of heat addition can be increased. (6 marks)

Or

12. With the help of a diagram, explain the working of any one water-tube boiler. (12 marks)

Turn over

13. Derive an expression for the mass flow rate through a nozzle as a function of pressure ratio. (12 marks)

Or

14. An impulse steam turbine has a number of pressure stages, each having a row of nozzles and a single ring of blades. The nozzle angle in the first stage is 20° and the blade angle at exit is 30° with reference to the plane of rotation. The mean blade speed is 130 m/s and the velocity of steam leaving the nozzles is 330 m/s. Taking the blade friction factor as 0.8 and a nozzle efficiency of 0.85, determine the work done in the stages per kg of steam and the stage efficiency. (12 marks)

15. Derive the optimum pressure ratio in an ideal gas turbine plant for maximum network. How is the expression modified when compressor and turbine efficiencies are taken into consideration. What is the corresponding maximum network and cycle efficiency. (12 marks)

Or

16. (a) Discuss the effect of Reheating and intercooling in a gas turbine plant. (6 marks)

(b) Explain with a neat sketch the combustion chamber of a gas turbine plant. (6 marks)

17. Explain the working of low temperature solar power generation cycle using flat plate collectors. (12 marks)

Or

18. Explain the working of a servo tracking system. (12 marks)

19. Enumerate and explain various modern ash handling systems. (12 marks)

Or

20. Discuss the various types of draught used in usual practice. (12 marks)

[5 × 12 = 60 marks]

G 7126 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, APRIL 2011

Fifth Semester

Branch : Mechanical/Automobile Engineering

COMPUTER PROGRAMMING (M, U)

(Supplementary)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

Part A

Each question carries 4 *marks.*

1. Write a note on C-constants.
2. Explain the syntax of if-else statement.
3. Compare bubble sorting and quick sorting.
4. Define a Union. What are its uses ?
5. Define global and local variables. Explain their uses.
6. Explain with an example the concept of recursion.
7. Explain the difference between 'call by reference' and 'call by value'.
8. Discuss the significance of dynamic memory allocation.
9. What are the differences in the handling of text and binary files ?
10. What is a command line argument ? Explain with an example.

(10 × 4 = 40 marks)

Part B

Each question carries 12 *marks.*

11. (a) Explain with syntax the uses of the built in I/O functions of C.

Or

(b) Write a program to evaluate sin (x) for x from 0 to 3.141 in steps of 0.01.

12. (a) Write a program to arrange 100 names in alphabetic order.

Or

(b) Write a program to illustrate the method of sending an entire structure as a parameter of a function.

Turn over

13. (a) Write a function power that computes x raised to the power y for integer x and y and returns double-type value.

Or

(b) Use recursive calls to evaluate :

$$f(x) = x - x^3/3! + x^5/5! - x^7/7! + \cdots.$$

14. (a) Explain with examples how pointers are used in arithmetic operations.

Or

(b) Write a program using pointers to read in an array of integer and print its elements in the reverse order.

15. (a) Write a program to copy the contents of one file into another.

Or

(b) Write a program that will receive a file name and a line of text as command line arguments and write the text to the file.

(5 × 12 = 60 marks)

G 7145 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, APRIL 2011

Fifth Semester

Branch—Mechanical Engineering/Automobile Engineering

MECHATRONICS AND CONTROL SYSTEMS (MU)

(Supplementary)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

Part A

Each question carries 4 *marks.*

1. Mention any *four* applications of Mechatronics.
2. Distinguish between active and passive transducers.
3. Explain the importance of PLC systems.
4. Explain the principle of computerised tomographic scan.
5. Distinguish between an open loop and closed loop system.
6. Explain the significance of a transfer functions.
7. Explain the concept of system stability.
8. Define the characteristic equation of a closed system. Explain how it may be used to check the stability of the system.
9. State and explain Nyquist stability criterion.
10. What information can you obtain from the root locus ?

(10 × 4 = 40 marks)

Part B

Each question carries 12 *marks.*

11. (a) Comment on the scope of Mechatronics. (6 marks)

    (b) Explain the various types of sensors used in different systems. (6 marks)

Or

12. (a) With neat sketch explain how the displacement is measured (using transducers). (6 marks)

    (b) With a neat sketch explain the 4/3 directional control valves in a hydraulic circuit system. (6 marks)

Turn over

13. Comment on the various types of Input and output (I/O) systems. Briefly explain these functions.

(12 marks)

Or

14. Construct a ladder diagram to the operation of a pressure regulating solve. It must open when the pressure is below the standard pressure and close when the pressure exceed a standard value.

(12 marks)

15. (a) Find the transfer function of the given electrical network.

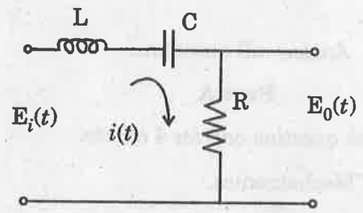


Fig.1.

(7 marks)

(b) Explain the procedure to determine the transfer function of a control system. (5 marks)

Or

16. Draw the electric analog, by f.v. and f-i analogy of the mechanical system given below. Write the equilibrium equation of the mechanical system :

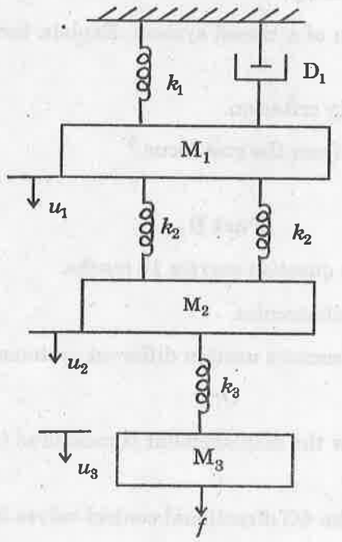


Fig.2.

(12 marks)

17. Derive an equation for a first order system with step input. What are the salient features of the response ?

(12 marks)

Or

18. Determine the range of K for a stable system when equations are :

(i) $2s^3 + 6s^2 + 6s + (1 + K) = 0$.

(ii) $s^3 + 10s^2 + 24s + K = 0$.

(2 × 6 = 12 marks)

19. A closed loop systems for which open loop T.F. is :

$$G(s)\,H(s) = \frac{K}{(s+3)(s+5)\left(s^2+2s+2\right)}.$$

Draw the Root loci of the system of $0 \leq K \leq \infty$. Also determine the gain margin if K = 15.

(12 marks)

Or

20. The open loop transfer function is given on $G(s)H(s) = \frac{s+2}{(s+1)(s-1)}$. Determine the stability of the closed loop system by Nyquist criterion.

(12 marks)

[5 × 12 = 60 marks]

11. It is required to set out the profile of a cam to give the following motion to reciprocating follower with a flat mushroom contact face :

(i) Follower to have a stroke of 20 mm during 120° of cam rotation.

(ii) Follower to dwell for 30° of cam rotation.

(iii) Follower to return to its initial position during 120° of cam rotation.

(iv) Follower to dwell for remaining 90° of cam rotation. The minimum radius of the cam is 25 mm. The out stroke of the follow is performed with simple harmonic motion and the return stroke with equal uniform acceleration and retardation.

(5 × 12 = 60 marks)

G 7135 (Pages : 4) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, APRIL 2011

Fifth Semester

Branch : Mechanical Engineering

THEORY OF MACHINES–II (M)

(Supplementary)

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*

Each question carries 4 *marks.*

1. (a) What is principle of virtual work ? Explain with suitable example.

(b) What are free body diagrams of a mechanism ? How are they helpful in finding the forces acting on various members of the mechanisms ?

(c) Define and explain the superposition theorem as applicable to a system of forces acting on a mechanism.

(d) State and explain D'Alemberts principle.

(e) What is the function of a governor ? How does it differ from that of a flywheel ?

(f) How do you account the inertia of a connecting rod while doing dynamic analysis ?

(g) What is centre of percussion ? Give an example of which it is considered in design.

(h) Explain the gyroscopic effect on four wheeled vehicles.

(i) What do you mean by spin, precision and gyroscopic planes ?

(j) What is a tangent cam ? Find the expression for the velocity and acceleration of a roller follower for such a cam.

(10 × 4 = 40 marks)

Part B

Each question carries 12 *marks.*

2. The following data relate to a four-link mechanism :

Link	Length	Mass	MOI about an axis through centre of mass
AB	60 mm	0.2 kg	80 kg. mm^2
BC	200 mm	0.4 kg	1600 kg. mm^2
CD	100 mm	0.6 kg	400 kg. mm^2
AD	140 mm		

AD is the fixed link. The centres of mass for the links BC and CD lie at the midpoints, whereas the centre of mass for link AB lies at A. Find the drive torque on the link AB at the instant when it rotates at an angular velocity of 47.5 rad/s counter-clockwise and ∠DAB 135°. Neglect gravity effects.

Or

3. The connecting rod of a vertical high-speed engine is 600 mm long between centers and has a mass of 3 kg. Its center of mass lies at 200 mm from the big end bearing. When suspended as a pendulum from the gudgeon pin axis, it makes 45 complete oscillations in 30 seconds. The piston stroke is 250 mm. The mass of the reciprocating part is 1.2 kg. Determine the inertia torque on the crank shaft when the crank makes an angle of 140° with top dead center. The engine speed is 1500 r.p.m.

4. Each ball of a Porter governor has a mass of 3 kg. and the mass of the sleeve is 15 kg. The governor has equal arms each 200 mm long and pivoted on the axis of rotation. When the radius of rotation of the balls is 120 mm, the sleeve begins to rise and 160 mm. at the maximum speed. Determine (a) the range of speed ; (b) the lift of the sleeve ; (c) the effort of the governor and (d) the power of the governor.

Or

5. In spring controlled governor, the controlling force curve is a straight line. The balls are 400 mm. apart when the controlling force is 1500 N and 240 mm when it is 800 N. The mass of each ball is 10 kg. Determine the speed at governor runs when the balls are 300 mm apart. By how much should the initial tension be increased to make the governor isochronous ? Also find the isochronous speed.

6. The turning-moment diagram for a petrol engine is drawn to a vertical scale of 1 mm to 6 N.m and a horizontal scale of 1 mm to 1°. The turning moment repeats itself after every half revolution of engine. The areas above and below the mean torque line are 305, 710, 50, 350, 980 and 275 mm^2. The rotating parts amount to a mass of 40 kg at a radius of gyration of 140 mm. Calculate the coefficient of fluctuation of speed if the speed of the engine is 1500 r.p.m.

Or

7. A certain machine requires a torque of (1500 + 200 sin θ) N.m to drive it, where θ is the angle of rotation of the shaft. The machine is directly coupled to an engine which produces a torque of (1500 + 200 sin θ) N.m. The flywheel and the other rotating parts attached to the engine have a mass of 300 kg at a radius of gyration of 200 mm. If the mean speed is 200 r.p.m., find (a) the fluctuation of energy ; (b) the total percentage of fluctuation of speed and (c) the maximum and minimum angular acceleration of the flywheel and the corresponding shaft positions.

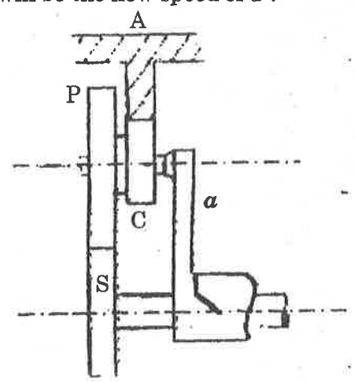
8. Each wheel of a four wheeled, rear engine automobile has a moment of inertia of 2.4 kgm^2 and an effective diameter of 660 mm. The rotating parts of the engine have a moment of inertia of 1.2 kgm^2. The gear ratio of the engine to the back wheel is 3 to 1. The engine axis is parallel to the rear axle and the crank shaft rotates in the same sense as the road wheels. The mass of the vehicle is 2200 kg and the center of the mass is 550 mm above the road level. The track width of the vehicle is 1.5 m. Determine the limiting speed of the vehicle around a curve with 80 m radius so that all the four wheels maintain contact with the road surface.

Or

9. The number of teeth in the gear shown in figure are as follows :

$T_S = 18$, $T_P = 24$, $T_C = 12$ and $T_A = 72$.

P and C forms a compound gear carried by the arm *a* and the annular gear A is held stationary. Determine the speed of the output at *a*. Also find the holding torque required on A if 5 kW is delivered to S at 800 r.p.m. with an efficiency of 94 %. In case the annulus rotates at 100 r.p.m. in the same direction as S, what will be the new speed of *a* ?



10. Draw a cam profile to drive an oscillating roller follower to the specifications given below :

(a) Follower to move outwards through an angular displacement of 20° rotation of the cam.

(b) Follower to return to its initial position during next 120° rotation of the cam.

(c) Follower to dwell during the next 120° of cam rotation. The distance between pivot centre and roller centre is equal to 120 mm ; distance between pivot centre and cam axis equals 130 mm ; minimum radius of cam is 40 mm ; radius of roller is 10 mm ; inward and outward strokes takes place with simple harmonic motion.

Or

G 7113 (Pages : 3) Reg. No.....ME

Name.....

B.TECH. DEGREE EXAMINATION, APRIL 2011

Fifth Semester

Branch—Civil/Mechanical/Electrical/Electronics/Electronics and Communication/ Polymers/Applied Electronics and Instrumentation/Electronics and Instrumentation/ Automobile Engineering

ENGINEERING MATHEMATICS—IV (CMELPASU)

(Supplementary)

Time : Three Hours Maximum : 100 Marks

Answer **one** *question from each module.*
All questions carry equal marks.

Module I

1. (a) Evaluate $\int_C \left\{(z+1)/(z^2+2z+4)\right\} dz$ where C is the circle $|z+1+i|=2$.

(b) Expand $f(z)=1/(z+1)(z+2)$ as a Taylor's series about the point $z=2$.

Or

2. (a) Find the Laurent's series for $f(z)=1/(z-1)(z-2)$ in the regions :

(i) $1<|z|<2$,

(ii) $|z|>2$ and

(iii) $0<|z-1|<1$.

(b) Evaluate $\int_0^{\pi} \frac{\cos 2\theta}{5+4\cos\theta} d\theta$.

Module II

3. (a) Find the root of $xe^x-2=0$ correct to four places of decimals using Regula Falsi method.

(b) Using Jacobi's method solve correct to four decimal places :

$10x+y+z=12$, $2x+10y+z=13$, $2x+2y+10z=14$.

Or

4. (a) Find the value of $\sqrt{10}$ correct to four decimal places using Newton-Raphson method.

(b) Applying Gauss-Seidel method solve correct to four places of decimals :

$2x - y + 11z = 20,\ 10x - 2y + z = 12,\ x + 9y - z = 10.$

Module III

5. (a) Using Euler's modified method compute the value of y when $x = 0.1$ given that :

$y^1 = x^2 + y,\ y(0) = 1,\ h = 0.05.$

(b) Using Milnes predictor corrector method find $y(0.4)$ and $y(0.5)$ given $\frac{dy}{dx} = 1 + xy^2 +\ y(0) = 1,$

$y(0.1) = 1.105,\ y(0.2) = 1.223$ and $y(0.3) = 1.355.$

Or

6. (a) Compute $y(0.5)$ and $y(1)$ using Taylor series method where $\frac{dy}{dx} = x^2 + y^2,\ y(0) = 1.$

(b) Given $\frac{dy}{dx} = x + 2y$ where $y = 1$ when $x = 0$ using Runge-Kutta method compute $y(0.2)$ and $y(0.4)$ correct to four decimal places.

Module IV

7. (a) Find the z transforms of the following :–

(i) $\cosh n\theta$;

(ii) $\cos\left\{\frac{n\pi}{2} + \frac{\pi}{4}\right\}$;

(iii) $(n + 1).$

(b) Use convolution theorem to evaluate $z^{-1}\left\{z^2/(z-1)(z-3)\right\}.$

Or

8. (a). Evaluate $z^{-1}\left\{\left(3z^2 + 2\right)/(5z-1)(5z+2)\right\}.$

(b) Using Z transforms solve $y_{n+2} + 4y_{n+1} + 3y_n = 2^n$ with $y_0 = 0$ and $y_1 = 1.$

Module V

9. (a) Using Simplex method solve :

Maximize $Z = 6x_1 + 4x_2$

subject to $-2x_1 + x_2 \le 2$

$x_1 - x_2 \le 2$

$3x_1 + 2x_2 \le 9$

$x_1, x_2 \ge 0$

(b) Using Big M method solve :

Minimize $Z = 4x_1 + 2x_2$ such that

$3x_1 + x_2 \ge 27$

$x_1 + x_2 \ge 21$

$x_1 + 2x_2 \ge 30$

$x_1, x_2 \ge 0$

Or

10. (a) Use two phase method to solve :

Maximize $Z = 3x_1 - x_2$ such that

$2x_1 + x_2 \ge 2$

$x_1 + 3x_2 \le 2$

$x_2 \le 4$

$x_1, x_2 \ge 0$

(b) Solve the following transportation problem :—

	D_1	D_2	D_3	D_4	D_5	*Supply*
O_1	3	4	6	8	9	20
O_2	2	10	1	5	8	30
O_3	7	11	20	40	3	15
O_4	2	1	9	14	16	13
Demand	40	6	8	18	6	78

(5 × 20 = 100 marks)

G 7117 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, APRIL 2011

Fifth Semester

Branch : Mechanical/Automobile Engineering

MANUFACTURING PROCESSES (MU)

(Supplementary)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions in Part A and* **five** *questions from Part B.*

Part A

1. What are the properties required for good moulding sand ?
2. Illustrate the various components of a gating system.
3. How are Arc welding electrodes specified ?
4. Explain the principle of flame cutting.
5. Explain theory and mechanics of rolling.
6. How does a Two High Reversing Rolling Mill Work ?
7. Differentiate hot and cold extrusion processes with examples.
8. List the various Press Working Operations and explain any two of them.
9. Compare Open and Closed Die forging.
10. List the various forging defects.

(10 × 4 = 40 marks)

Part B

11. Sketch and explain Centrifugal Casting Process.

Or

12. Explain the steps involved in Shell Mould Casting.
13. What is the principle of Solid State Welding ? Explain the Friction Welding Process.

Or

14. Sketch and explain TIG welding.
15. Explain Electromagnetic and explosive forming processes.

Or

16. Explain the rolling of tubes and wheels.

17. Sketch and explain extrusion of seamless tubes.

Or

18. Describe the operation of progressive and Compound Dies with the help of neat figures.

19. What are the advantages of Press forging over Drop forging ? Explain the upsetting process.

Or

20. Write short notes on :

(a) Deep drawing.

(b) Tube Piercing.

(c) Coining.

(5 × 12 = 60 marks)