F 9224 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Fifth Semester

Branch : Mechanical Engineering/Automobile Engineering

MECHATRONICS AND CONTROL SYSTEMS (MU)

(Regular/Improvement/Supplementary)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

Part A

Each question carries 4 *marks.*

1. What is an anti-aliasing filter ?
2. Differentiate between Null and Deflection sensors.
3. What is a flag register ?
4. Discuss the ISO-OSI model for data transfer in computer networks.
5. Explain any one type of computer printer.
6. Explain on-off type close loop control system.
7. Explain the construction of a vane type hydraulic motor.
8. Define a first order system with examples.
9. Differentiate between transient and steady state responses of a system.
10. Explain compensators in system models.

(10 × 4 = 40 marks)

Part B

Each question carries 12 *marks.*

11. (a) Explain the buffer amplifier configuration of the OP-Amp and state its uses. (6 marks)

    (b) Explain the construction and working of a thermopile. (6 marks)

Or

12. (a) Explain the working of an incremental optical encoder. (8 marks)

    (b) Explain the working of LCDs. (4 marks)

13. (a) Compare serial and parallel ports for data transfer. (6 marks)

    (b) Discuss the data storage techniques used in CDs and DVDs. (6 marks)

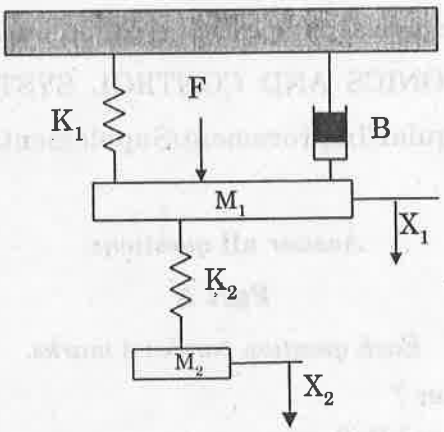
Or

Turn over

14. (a) Explain the various parts of a dialysis machine. (7 marks)

(b) Explain CSMA/CD. (5 marks)

15. Construct the block diagram model and find the transfer functions, $\frac{x_1}{F}, \frac{x_2}{F}, \frac{x_2}{x_1}$ for the following mechanical system.



(12 marks)

Or

16. Explain with a neat sketch, the construction and working of a linear hydraulic servo actuator. (12 marks)

17. Compute the steady-state ramp error for a basic feedback system with $G(s) = \frac{1}{s(s+5)}$ and $H(s) = 1$. (12 marks)

Or

18. Explain the effect of pole location on the transient response of a system with suitable time response curves. (12 marks)

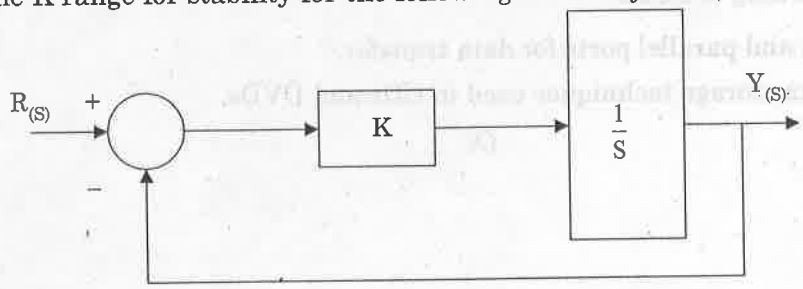
19. Using the root locus method find out the range of parameter K for the system with feedback and transfer functins given below :

$$G(s) = \frac{(s+2)}{(s+3)(s+K)} \text{ and } H(s) = 1.$$

(12 marks)

Or

20. Find the K range for stability for the following control system :



(12 marks)

[5 × 12 = 60 marks]

F 9231 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Fifth Semester

Branch : Mechanical/Automobile Engineering

THERMAL ENGINEERING—I (M, U)

(Regular/Improvement/Supplementary)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

Part A

Each question carries 4 *marks.*

1. Explain why rankine cycle is considered as standard reference cycle for steam power plants.
2. What is a fusible plug and state where it is located in a boiler ?
3. Explain super saturated flow in nozzles.
4. Discuss the advantages of a steam turbine over the steam engines.
5. Draw the schematic diagram of a simple gas turbine cycle with intercooler and heat exchanger. Draw also the P-V and T-S diagrams of the cycle.
6. What are the basic requirements of a gas turbine combustion chamber ?
7. What are the limitations of solar energy ?
8. How does sun tracking helps in energy collection by a flat plate solar collector ?
9. How the ash produced carries the importance in the selection of thermal power plant site ?
10. What are the limitations of chimney draught ?

(10 × 4 = 40 marks)

Part B

Each question carries 12 *marks.*

11. (a) Determine the enthalpy, volume, internal energy and entropy of superheated steam at 15 bar pressure and 220°C. The volume of water may be neglected and take specific heat of superheat equal to 2.2 kJ/kg K.

Or

(b) Explain with neat sketches of the following :—

(i) Water level indicator ; (ii) Air pre heater ;

(iii) Economizer ; (iv) pressure gauge.

Turn over

12. (a) Define critical pressure ratio for the nozzle of the steam turbine. Obtain analytically its value in terms of the index of expansion.

Or

(b) A single stage steam turbine is supplied with steam at 5 bar, 200°C at the rate of 50 kg/min. It expands into a condenser at a pressure at 0.2 bar. The blade speed is 400 m/s. The nozzles are inclined at an angle of 20° to the plane of the wheel an d the outlet blade angle is 30°. Neglecting friction losses, determine the power developed, blade efficiency, and stage efficiency.

13. (a) A gas turbine with a regenerator has got the following data :—

Compressor inlet temperature : 290 K

Compressor outlet temperature : 460 K

Inlet temperature of the turbine : 900°C

Outlet temperature of the turbine : 467°C

Assuming no pressure drop in the heat exchanger, calculate :

(i) the pressure ratio of the compressor and turbine.

(ii) the specific power output.

(iii) the overall efficiency of the cycle.

(iv) the work required to drive the compressor. Assume 100% mechanical efficiency.

Or

(b) A centrifugal compressor used as a super charger for acro engines handles 150 kg/min of air. The suction pressure and temperature are 1 bar and 290 K. The suction velocity is 80 m/s. After compression in the impeller the conditions are 1.5 bar, 345 K and 220 m/s. Calculate :

(i) Isentropic efficiency.

(ii) Power required to drive the compressor.

(iii) The overall efficiency of the unit.

It may be assume that KE of air gained in the impeller is entirely converted into pressure in the diffuser.

14. (a) Explain about solar thermal power generation.

Or

(b) How solar air collectors are classified ? Describe a collector used in power plant for generation of electrical energy.

15. (a) Describe the various types of burners used to burn pulverized coal.

Or

(b) Explain the working of a diesel power plant.

(5 × 12 = 60 marks)

F 9196 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Fifth Semester

Branch : Mechanical Engineering/Automobile Engineering

MANUFACTURING PROCESSES (MU)

(Regular/Improvement/Supplementary)

Time : Three Hours Maximum : 100 Marks

Part A

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

1. Explain various types of pattern allowances.
2. How a shell-mould casting is made ?
3. What do you understand by gas welding ?
4. How the welding of high speed steel is carried out ?
5. Why lead rolling at room temperature is considered as hot rolling process ?
6. Explain how seamless pipes are manufactured in rolling.
7. What is meant by indirect extrusion ?
8. How thin walled seamless cylinders are manufactured ?
9. What is meant by drop forging ?
10. Explain various steps in 50Ps coin manufacturing process.

(10 × 4 = 40 marks)

Part B

Answer **all** *questions.*
Each question carries 12 *marks.*

11. Explain various types of moulding sands using in foundry.

Or

12. Write the various stages in core making. What do you understand by core setting ?
13. With the help of a neat sketch, explain submerged arc welding process.

Or

14. Explain the various types of joints commonly used in welding.

Turn over

15. Explain in detail material behaviour in hot rolling.

Or

16. With the help of neat sketch, explain various types of rolling mills.

17. What are the common components manufactured by cold drawing process. Explain the manufacturing process of any one such component with the help of a neat sketch.

Or

18. With the help on a neat sketch differentiate forward and reverse extrusion process. Mention any *four* components manufactured by these processes.

19. Explain why crankshaft of an automobile is manufactured by forging and not by casting.

Or

20. Differentiate drop forging and press forging.

(5 × 12 = 60 marks)

F 9192 (Pages : 3) Reg. No.....ME.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Fifth Semester

Branches : Civil/Mechanical/Electrical and Electronics/Electronics and Communication/ Polymer Science/Applied Electronics and Instrumentation/Electronics and Instrumentation/ Automobile/Aeronautical Engineering

ENGINEERING MATHEMATICS—IV (CMELPASUF)

(Regular/Improvement/Supplementary)

Time : Three Hours Maximum : 100 Marks

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

Module I

1. (a) Evaluate $\int_C z^2 dz$, where C is the curve passing through the points $1+i$ and $2+4i$ and specified as (i) the arc $y = x^2$; (ii) the straight line joining the points $1+i$ and $2+4i$. (10 marks)

(b) Find the Laurent's expansion for $\frac{7z-2}{(z+1)z(z-2)}$ in the region given by (i) $0 < |z+1| < 1$; (ii) $1 < |z+1| < 3$; (iii) $|z+1| > 3$. (10 marks)

Or

2. (a) Use Cauchy's integral formula to find $\oint_C \frac{1}{1-z^2} dz$, where C is (i) $|z| = ½$; (ii) $|z| = 2$; (iii) $|z-1| = 1$. (10 marks)

(b) Evaluate $\int_0^{2\pi} \frac{d\theta}{(a+b\cos\theta)^2}$, $a > b > 0$ by contour integration. (10 marks)

Module II

3. (a) Using the method of bisection, find a root of the equation $x^3 - x^2 + x - 7 = 0$ correct to 3 decimal places. (10 marks)

Turn over

(b) Use Jacobi method to solve :

$$\begin{aligned} 2x - y + 11z &= 20 \\ x + 9y - z &= 10 \\ 10x - 2y + z &= 12 \end{aligned}$$

correct to 4 decimal places.

(10 marks)

Or

4. (a) Use Gauss Seidel to solve

$$\begin{aligned} 2x + 5y - 2z - 3 &= 0 \\ x + y - 3z + 6 &= 0 \\ 8x - y + z - 18 &= 0 \end{aligned}$$

correct to 4 decimal places.

(10 marks)

(b) Derive a Newton-Raphson iteration formula for finding the cube root of a +ve number C. Hence find (i) C = 12 ; (ii) C = 25.

(10 marks)

Module III

5. (a) Given : $y' = x^2 - y$, $y(0) = 1$, $y(.1) = .90516$, $y(.2) = .82127$, $y(.3) = .74918$. Obtain the value of y (.4) using Milne's method.

(10 marks)

(b) Use Taylor's series to find the values of y for $x = .1, .2, .3$, given $\frac{dy}{dx} = 1 - y$, $y(0) = 0$. Tabulate the numerical and exact solutions.

(10 marks)

Or

6. (a) Solve using Runge-Kutta method :

$$\frac{dy}{dx} + \frac{y}{x} = \frac{1}{x^2},\ y(1) = 1.$$

Find the value of y when $x = 1.1$.

(10 marks)

(b) Use Euler's method to obtain y (.2), y (.4) and y (.6) correct to 3 decimal places if y satisfies $y' = y - x^2$, $y(0) = 1$.

(10 marks)

Module IV

7. (a) Solve $y_{k+2} + 2y_{k+1} + y_k = k$ where $y_0 = y_1 = 0$. (10 marks)

(b) Find $Z^{-1}\left(\frac{z^2+1}{z^2-2z+2}\right)$. (10 marks)

Or

8. (a) Find (i) $z\,(-2)^n$; (ii) $z\,(na^n)$; (iii) $z\,(1/(n+2)\,(n+1))$. (10 marks)

(b) State and prove the convolution theorem of z-transform. (10 marks)

Module V

9. (a) Apply graphical method to solve :

Maximize $Z = x_1 - 2x_2$ subject to

$-x_1 + x_2 \le 1,\ 6x_1 + 4x_2 \ge 24,\ 0 \le x_1 \le 5,\ 2 \le x_2 \le 4$ and $x_1, x_2 \ge 0$.

(10 marks)

(b) Solve the Transportation problem :

	A	B	C	D	E	Available
P	4	1	2	6	9	100
Q	6	4	3	5	7	120
R	5	2	6	4	8	120
Demand	40	50	70	90	90	

(10 marks)

Or

10. (a) Use duality to solve the L.P.P. :

Minimize $Z = 2x_1 + 2x_2$ subject to

$2x_1 + 4x_2 \ge 1,\ -x_1 - 2x_2 \le -1,\ 2x_1 + x_2 \ge 1$ and $x_1, x_2 \ge 0$.

(10 marks)

(b) Use Simplex method to :

Minimize $Z = x_2 - 3x_3 + 2x_5$

subject to :

$$\begin{aligned} 3x_2 - x_3 + 2x_5 &\le 7 \\ -2x_2 + 4x_3 &\le 12 \\ -4x_2 + 3x_3 + 8x_5 &\le 10 \text{ and} \\ x_2, x_3, x_5 &\ge 0. \end{aligned}$$

(10 marks)

[5 × 20 = 100 marks]

F 9214 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Fifth Semester

Branch : Mechanical Engineering

THEORY OF MACHINES—II (M)

(Regular/Improvement/Supplementary)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

Part A

Each question carries 4 *marks.*

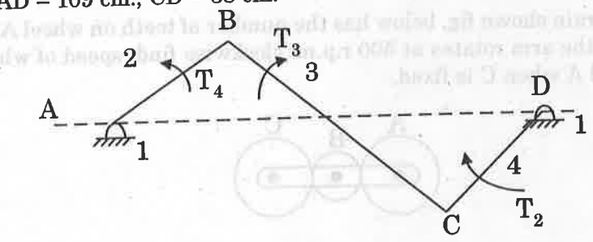
1. (a) Derive an expression for friction circle.
   (b) Explain the equilibrium condition for 3 force and 2 force member in mechanisms.
   (c) Find an equation for finding the location of masses in an equivalent dynamic system.
   (d) Sketch and explain the working of differential gear mechanism.
   (e) Define and explain the following terms relating to governors, stability, sensitiveness, isochronism, hunting.
   (f) What is gyroscopic couple ? Derive a formula for its magnitude.
   (g) Explain principle of virtual work with suitable example.
   (h) Derive an expression for maximum velocity when a cam follower executes simple harmonic motion.
   (i) State and explain D Alembert's principle.
   (j) Differentiate between Flywheel and Governor.

(10 × 4 = 40 marks)

Part B

Each question carries 12 *marks.*

2. In the four bar mechanism shown Fig. below, torque T_3 and T_4 are 50 Nm and 60 Nm respectively. For the static equilibrium of the system, find the required input torque T_2 ? BC = 80 cm., AB = 35 cm., AD = 109 cm., CD = 38 cm.



Or

3. A single cylinder vertical engine has a bore of 30 cm., stroke of 36 cm. and a connecting rod of length 72 cm. The weight of reciprocating part is 125 kg. When the piston is at quarter stroke from TDC and is moving downwards, the net pressure on it is 0.5 MPa. If the speed of the engine is 250 r.p.m., calculate the turning moment on the crank shaft at the instant the corresponding to the position stated above.

4. The controlling force in a spring controlled governor is 2000 N when radius of rotation of the ball is 2500 mm. and it is 900 N when it is 135 mm. Mass of each ball is 8 kg. If the controlling force is a straight line, determine the controlling force and speed of rotation when the radius of rotation is 150 mm. Find the initial tension increase for the governor to isochronous and also the isochronous speed.

Or

5. In a Hartnell spring loaded governor, length of vertical and horizontal arms of the bell crank lever are 80 mm. and 40 mm. respectively. Each ball is of mass 0.85 kg. The minimum and maximum radii of the rotation of the balls are 60 mm. and 90 mm. respectively. The minimum equilibrium speed of the governor is 300 r.p.m. and the maximum speed is 6 % greater than the minimum. Neglecting obliquity of the arms, determine the initial compression of the spring and the equilibrium speed corresponding to radius of rotation of 75 mm. ?

6. The torque delivered by a two stroke engine is represented by $T = (900 + 290 \sin 2\theta - 450 \cos 2\theta)$, where θ is the angle turned by crank from the inner dead centre. The engine sped is 250 r.p.m. The mass of the flywheel is 400 kg. and radius of gyration 400 mm. Determine the power developed, total percentage of fluctuation of speed, the angular acceleration of flywheel when the crank has rotated through an angle of 60° from the inner dead centre and the maximum acceleration and retardation of the flywheel.

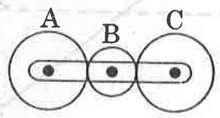
Or

7. A machine requires a torque of $(500 + 500 \sin \theta)$ kg.-m. to drive it, where θ is the angle of rotation of the shaft measured from certain datum. The machine is directly coupled to an engine which produces a torque of $(5000 + 600 \sin 2\theta)$ kg.-m. The flywheel and other rotating parts are having radius of gyration of 40 cm. If the mean speed is 15 r.p.m., find the mean fluctation of energy, percentage fluctuation of speed and maximum and minimum angular accelration of flywheel and corresponding shaft positions.

8. An aeroplane makes a complete half circle at 50 m. radius, towards left, when flying at 200 km./hr. The rotary engine and propeller of the plane has mass of 400 kg. with a radius of gyration of 300 mm. The engine runs at 20,000 r.p.m., clockwise when viewed from the rear. Find the gyroscopic couple on the aircraft and state its effect on it ? What will be the effect if the plane turns towards the right instead of left ?

Or

9. An epicyclic gear train shown fig. below has the number of teeth on wheel A, B, C to be 48, 24 and 50 respectively. If the arm rotates at 500 r.p.m. clockwise find, speed of wheel C when A is fixed and speed of wheel A when C is fixed.



10. A cam operating with uniform angular velocity operates a reciprocating follower through a roller 5 cm. in diameter. The line of operation of the folower is 2.5 cm. from the axis of the cam. The stroke of the follower is 5 cm. and the minimum radius of the cam is also 5 cm. The follower moves outward and inwards with SHM, each stroke occupying 75° of cam rotation. During the remainder of cam rotation, the follower dwells at the bottom of its stroke. Draw the cam profile.

Or

11. A tangent cam with a base circle diameter of 60 mm. operates a roller follower 20 mm. in diameter. The line of stroke of the follower passes through the axis of the cam. The angle between the tangential faces of the cam is 60°, speed of the cam shaft 200 r.p.m. and the lift of the follower 15 mm. find (a) main dimensions of the cam ; (b) the acceleration of the follower at the beginning of the lift, where the roller just touches the nose, and at the apex of the circular nose.

$(5 \times 12 = 60$ marks)

F 9205 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

Fifth Semester

Branch : Mechanical Engineering/Automobile Engineering

COMPUTER PROGRAMMING (MU)

(Regular/Improvement/Supplementary)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

Part A

Each question carries 4 *marks.*

1. What is meant by pre-processor directive ?
2. Explain the syntax of switch statement.
3. Write the function that returns the length of a string.
4. What is bubble sorting ? Write the syntax of bubble sorting.
5. What is meant by a macro ?
6. What are the advantage of using functions to modularize a program ?
7. Explain the difference between the following two uses of the reference operator :

   &

   int & $r = n$;

   p = & n ;
8. How can a function return a pointer to its calling routine ?
9. Differentiate between text files and binary files.
10. Explain the way of appending a text file using in built function.

(10 × 4 = 40 marks)

Part B

Each question carries 12 *marks.*

11. Write a C program to sum 'n' integers.

Or

12. Write a C program to find the value of e^x using summation concept.
13. Write a program to read hundred integers and sort them in ascending order.

Or

14. How recursion is used in functions ? Explain with a suitable program.

Turn over

15. Write a program that will pass a structure containing name of a student his age and height to a function.

Or

16. Explain call by value and call by reference used by functions.

17. What do you understand by linked list ? Give an example.

Or

18. Write a program to read the name, age and address of a student using structure.

19. Write short notes on :

    (i) Transfer of data in blocks.

    (ii) Error handling functions.

Or

20. Write a program to open an existing text file "data.txt" and read the 10th line of it and print it on the console.

(5 × 12 = 60 marks)