G 1855

Reg. No..............................

Name..................................

B.TECH. DEGREE EXAMINATION, MAY 2018

Sixth Semester

Branch : Mechanical Engineering / Automobile Engineering

AU 010 601/ME 010 601—MECHANICS OF MACHINES (AU, ME)

(New Scheme—2010 Admission onwards)

[Supplementary]

Time : Three Hours

Maximum : 100 Marks

Part A

Answer all *questions.*
Each question carries 3 *marks.*

1. State principle of virtual work.

2. State D'Alemberts principle.

3. Briefly explain working of a centrifugal governor.

4. How the governor differ from flywheel ?

5. Write notes on coefficient of fluctuation of energy and coefficient of fluctuation of speed.

(5 × 3 = 15 marks)

Part B

Answer all *questions.*
Each question carries 5 *marks.*

6. Discuss the importance of turning moment diagram of a reciprocating engine.

7. Write notes on spin, precession and gyroscopic acceleration.

8. Briefly explain gyroscopic applied torque and reaction torque.

9. What are the functions of a brake ? Classify brakes according to method of actuation.

10. What is a dynamometer and explain the working principle of any one absorption dynamometer.
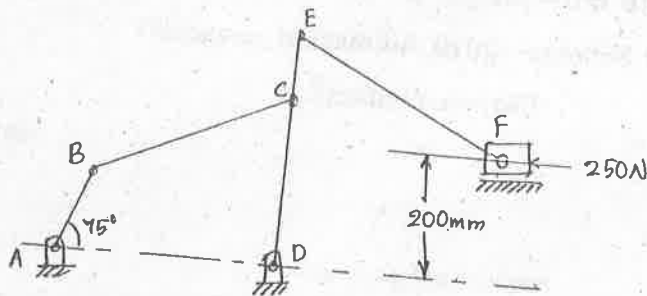
(5 × 5 = 25 marks)

Turn over

Part C

Answer all questions.
Each full question carries 12 marks.

11. Find the required input torque for the static equilibrium of the mechanism of figure shown. The dimensions are :

   AB = 150 mm., BC = AD = 500 mm., DC = 300 mm., CE = 100 mm. and EF = 450 mm.

Or

12. Find the magnitude and direction of the inertia torque on the crank shaft when the crank has turned 30° from the inner dead centre by graphical method. The details of the horizontal reciprocating engine is given below :

   Engine speed = 800 r.p.m.

   Mass of reciprocating parts = 150 kg.

   Crank length = 100 mm.

   Connecting rod mass = 100 kg.

   Length between centres = 460 mm.

   Distance of centre of mass from big end centre = 180 mm.

   Radius of gyration about an axis through centre of mass = 150 mm.

13. The upper arms of a porter Governor are pivoted on the axis of rotation their length being 30 cm. The lower arms are pivoted on the sleeve at a distance of 3 cm. from the axis, their lengths being 27 cm. Mass of each ball is 6 kg. and the sleeve mass is 55 kg. Determine the equilibrium speed for radius of rotation of 17 cm. and also the effect and power for 1 % speed change.

Or

14. Explain with neat sketch working of a Proel-Hartnell and Wilson-Hartnell governor.

15. The turning moment diagram of a multicylinder reciprocating engine is drawn to scale 1 mm. = 500 N-m Y-axis and 1 mm. = 4° X-axis. The area above and below the mean torque line are + 50, – 120, + 95, – 140, + 90, – 70 and + 95 mm.² when the engine is running at 1500 rpm. If the mean fluctuation of speed is not to exceed ± 1 % of the mean speed determine the mass of flywheel of radius of gyration of 400 mm.

O☀

16. A 5 kW induction motor running at 1000 rpm operates a rivetting machine, it has a flywheel fitted to it of mass 100 kg. and radius of gyration 0.4 m. Each rivetting takes 1 second and requires 15 kW. Determine :

   (a) The number of rivets closed per hour ; and

   (b) The fall in speed of the flywheel after the rivetting operation.

17. Explain the effect of gyroscope on the stability of an automobile.

Or

18. Mass of the engine fitted in an aeroplane is 400 kg. The radius of gyration of the revolving masses is 30 cm. The sense of rotation of mass is clockwise as viewed form the front of the engine and its speed is 2000 rpm. Determine the magnitude and direction of the gyroscopic couple acting on the aeroplane when its speed of flight is 125 kilometers per hour in a circular path of radius 30 meters in anticlockwise direction as viewed from the bottom ?

19. Explain with neat figure :

   (a) Internally expanding shoe brake.

   (b) Single plate clutch.

(2 × 6 = 12 marks)

Or

20. Explan the working of :

   (a) Poxy brake dynamometer.

   (b) Pope brake dynamometer.

(2 × 6 = 12 marks)

[5 × 12 = 60 marks]

G 1867

(Pages : 3)

Reg. No....................................

Name.....................................

B.TECH. DEGREE EXAMINATION, MAY 2018

Sixth Semester

Branch : Automobile Engineering/Mechanical Engineering/Production Engineering.

AU 010 602/ME 010 602/PE 010 602—HEAT AND MASS TRANSFER (AU, ME, PE)

(New Scheme—2010 Admission onwards)

[Improvement/Supplementary]

Time : Three Hours

Maximum : 100 Marks

Use of approved data book is permitted.
Assume any missing data if required.

Part A

Answer all questions.
Each question carries 3 marks.

1. Write notes on different modes of heat transfer.

2. Distinguish the difference between Forced convection and Natural convection.

3. What you understand by the term "effectiveness" in heat exchangers ?

4. Differentiate absorptivity, reflectivity and transmissivity.

5. Define "Fick's law of diffusion".

(5 × 3 = 15 marks)

Part B

Answer all questions.
Each question carries 5 marks.

6. The inner surface and outer surface temperature of a sphere pan is 250° C. and 45° C. The inner diameer of the pan is 2 m.and wall thickness is 25 cm. The equivalent thermal conductivity is 0.15 W/mK. Find the heat loss through the wall and also the heat flux.

7. Two spheres are placed in a channel as shown in figure for cooking. Two of the spheres has identical shape and at the same temperature of 60° C. The fluid velocity in the channel is non-uniform and its velocity profile is as shown in fig. which sphere cools more rapdily, explain.
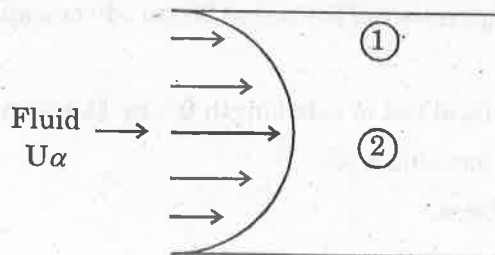
Turn over

8. Write down the boundary conditions which satisfies the temperature distribution in the boundary layer for five connection heat transfer between vertical flat plate and a fluid.

9. A sphere of radius r_1 is completely enclosed in a sphere of radius r_2. Determine the shape factors.

10. Define local mass average velocity, local molar weight, mass flux and molar flux.

$(5 \times 5 = 25 \text{ marks})$

Part C

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

11. When the two surfaces of a plane wall of 4 cm. thickness of unknown material are maintained at 80° C. and 40° C. respectively. The centre plane was found to be at 50° C. and the heat flow through the wall was 8 kW/m.^{2} Determine the thermal conductivity of the material as a function of temperature.

Or

12. A current carrying wire of 3 cm. diameter is to be insulated with rubber ($k = 0.163$ W/mK) to increase the current carrying capacity of the wire. If the convection heat transfer coefficient from the rubber surface to air is 10 W/m.^{2}K determine the critical thickness of insulation.

13. Air at atmospheric pressure and 30° C. flows across a tube bank consisting of 100 tubes of 1.25 cm. OD arranged in a staggered manner in 20 rows. The pitch to diameter ratio is 1.5 and the tube wall is maintained at 60° C. Calculate the convection heat transfer coefficient if the free stream velocity of air is 5 m/s.

Or

14. Calculate the rate of free convection heat transfer from a 5 cm. diameter sphere, the surface of which is maintained at 100° C. while it is exposed to atmospheric air at 30° C.

15. It is desired to use a double-pipe conter flow heat exchanger to cool 3 kg/s of oil ($Cp = 2.1$ kJ/kg.K) from 120° C. Cooling water is at 25° C. enters the heat exchanger at a rate of 10 kg/s. The overall heat transfer coefficient of the heat exchanger is 600 W/m.^{2}K and heat transfer area is 6 cm.^{2} Calculate the exit temperature of oil and water.

Or

16. One end of a very long copper (K = 386 W/mK) rod of 6 cm. diameter is kept in a furnace and is maintained at 650° C. While the surface of rod is exposed to air at temperture 25° C. If the heat transfer coefficient between the surface and air is 10 W/m.^{2}K, calculate the rate of heat transfer through the rod. Also estimate the temperature of the rod at 20 cm., 40 cm. and 60 cm. as measured from the hot end ?

17. A domestic oven has the shape of a cubical box of side length 0.5 m. Determine the shape factors :

    (a) Between bottom surface and one side wall.

    (b) Between top and bottom surfaces.

Or

18. Two very large parallel plates with emissivities 0.5 exchanges heat. Determine the percentage reduction in the heat exchanger rate if a polished aluminium radiation shield (ε = 0.04) is placed betwen the plates.

19. Dry air at 20° C. (ρ = 1.2 kg/m.^{3}, v = 15 × 10^{-6} m^2/s, D = 4.2 × 10^{-5} m.^{2}/s) flows over a flat plate of length 60 cm. which is covered with a thin layer of water, at a velocity of 1 m/s. Estimate the local mass transfer coefficient at a distance of 10 cm. from the leading edge and average mass transfer coefficient.

Or

20. Carbon tetrachloride contained in a glass tube of 35 cm. diameter is exposed to dry air at 35° C. The liquid level is 30 cm. below the open end of the tube. At 35° C. the diffusion coefficient beween CCl_4 and air is 6 × 10^{-6} m.^{2}/s and the saturation pressure of CCl_4 is 138 tour. Calculate the partial presure of CCl_4 at an elevation of 10 cm. above the liquid surface and mass of CCl_4 evaporated in one hour.

(5 × 12 = 60 marks)

G 1886   (Pages : 2)   Reg. No...............................

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B.TECH. DEGREE EXAMINATION, MAY 2018

Sixth Semester

Branch : Mechanical Engineering

ME 010 603—THERMAL SYSTEMS AND APPLICATIONS (ME)

(New Scheme—2010 Admission onwards)

[Improvement/Supplementary]

Time : Three Hours   Maximum : 100 Marks

Part A

Answer all questions.
Each question carries 3 marks.

1. Differentiate between wet, dry and superheated steam.

2. Write notes on supersaturated flow in a nozzle.

3. Draw the schematic diagram of a closed cycle gas turbine plant.

4. What is mean by mean plate temperature ?

5. Define draught.

                                                       (5 × 3 = 15 marks)

Part B

Answer all questions.
Each question carries 5 marks.

6. Draw Rankine cycle on P-v and T-s diagram and write notes on it.

7. What is mean by governing in steam turbines ?

8. Briefly explain focussing type solar collector.

9. Briefly explain regeneration and reheating in gas turbines.

10. Draw the layout of a diesel power plant.

                                                       (5 × 5 = 25 marks)

Turn over

Part C

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

11. 1 kg. of steam initially at dry saturated at 1.1 MPa expands in a cylinder following the law $pv^{1.3} = C$. The pressure at the end of expansion is 0.1 MPa. Determine :

    (a)   The final volume.   (b)   Final dryness fraction.

    (c)   The work done.   (d)   The change in internal energy.

    (e)   Heat transferred.

Or

12. Classify modern steam generators and write down various mountings and accessories.

13. An adiabatic steam nozzle is to be designed for a discharge rate of 11 kg./sec. of steam from 15 bar and 500° C. to a back pressur of 1 bar. The nozzle efficiency is 0.92 and functional loss is assumed to take place in the diverging portion of the nozzle only. Assume a critical pressure ratio of 0.545 %. Determine the throat and exit areas.

Or

14. A single stage impulse turbine rotor has a diameter of 1.5 m. running at 4000 r.p.m. The nozzle angle is 18°. Blade speed ratio is 0.42. The ratio of the relative velocity at outlet to relative velocity at inlet is 0.9. The outlet angle of the blade is 3° smaller than the inlet angle. The steam flow rate of 5 kg/s. Draw the velocity diagram and find the following :

    (a)   Velocity of whirl.   (b)   Axial thrust on the bearing.

    (c)   Blade angles.   (d)   Power developed.

15. Explain the working of a centrifugal and axial compressors.

Or

16. Explain cylindrical, annular and industrial type combustion chambers.

17. Write note on liquid flat plate collector : various losses and efficiency of solar collectors.

Or

18. Explain :

    (a)   Solar concentrators and receivers.

    (b)   Solar pond.

19. Nature of air draught explain different types of cooling towers.

Or

20. Explain different types of ash handling devices.

(5 × 12 = 60 marks)

B.TECH. DEGREE EXAMINATION, MAY 2018

Sixth Semester

Branch : Automobile Engineering/Mechanical Engineering

AU 010 604/ME 010 604—METROLOGY AND MACHINE TOOLS (AU, MU)

(New Scheme—2010 Admission onwards)

[Improvement/Supplementary]

Time : Three Hours   Maximum : 100 Marks

Part A

Answer all questions.

Each question carries 3 marks.

1. Write notes on duplicating lathe ?

2. What you understand by dressing of grinding wheels ?

3. List out the different types of Hobbing machines.

4. Differentiate frits and tolerances.

5. How we can measure the surface roughness ?

(5 × 3 = 15 marks)

Part B

Answer all questions.

Each question carries 5 marks.

6. Write notes on different types of drills used in drilling machine.

7. Briefly explain the various cutting forces during milling operation.

8. Explain briefly the screw cutting operation in a lathe.

9. What is the use of comparators ? Discuss the mechanical-optical comparator.

10. Explain pin method of measuring gear teeth.

(5 × 5 = 25 marks)

Part C

Answer all questions.

Each full question carries 12 marks.

11. Explain different accessories and attachments used in a lathe.

Or

12. Explain with neat figure, the working of a quick return mechanism.

Turn over

13. Explain different types of milling cutters used.

Or

14. Explain different types of honing machines and methods for honing.

15. Explain gear hobbing process and different types of gear hobbing machines.

Or

16. Explain the following process :

    (a) Thread milling.   (3 marks)

    (b) Die threading.   (3 marks)

    (c) Tapping.   (3 marks)

    (d) Thread rolling and thread grinding.   (3 marks)

17. Explain the following :—

    (a) Types of fits.   (3 marks)

    (b) Hole and shaft basis system.   (3 marks)

    (c) Taylor's theory of gauging.   (3 marks)

    (d) Random, erratic and drunken errors.   (3 marks)

Or

18. Explain the optical instruments for angle measurements.

19. Explain the methods for measuring squareness and surface roughness.

Or

20. Explain Laser interferometry and its applications.

$[5 \times 12 = 60 \text{ marks}]$

Reg. No.....................................

Name.....................................

B.TECH. DEGREE EXAMINATION, MAY 2018

Sixth Semester

Branch : Mechanical Engineering / Automobile Engineering

AU 010 605/ME 010 605—MECHATRONICS AND CONTROL SYSTEMS (AU, ME)

(New Scheme—2010 Admission onwards)

[Improvement/Supplementary]

: Three Hours   Maximum : 100 Marks

Part A

Answer all questions.
Each question carries 3 marks.

Differentiate active and passive transducers.

Narrate the commonly used protocol in communication.

Differentiate open loop and closed loop systems.

Write notes on step function and ramp function.

Define gain margin.

(5 × 3 = 15 marks)

Part B

Answer all questions.
Each question carries 5 marks.

Explain any two transducers which can measure the pressure.

Explain any one facult finding system.

What is a transfer function ?

Write notes on error analysis in a system.

What is Bode stability criteria ?

(5 × 5 = 25 marks)

Turn over

Part C

Answer all questions.

Each full question carries 12 marks.

11. Write notes on :

    (a) Signal conditioning.

    (b) Operational amplifiers.

    (c) Data acquisition and modulation.

Or

12. Explain workng of relays and solenoid switches and proxiity pickups with neat sketch.
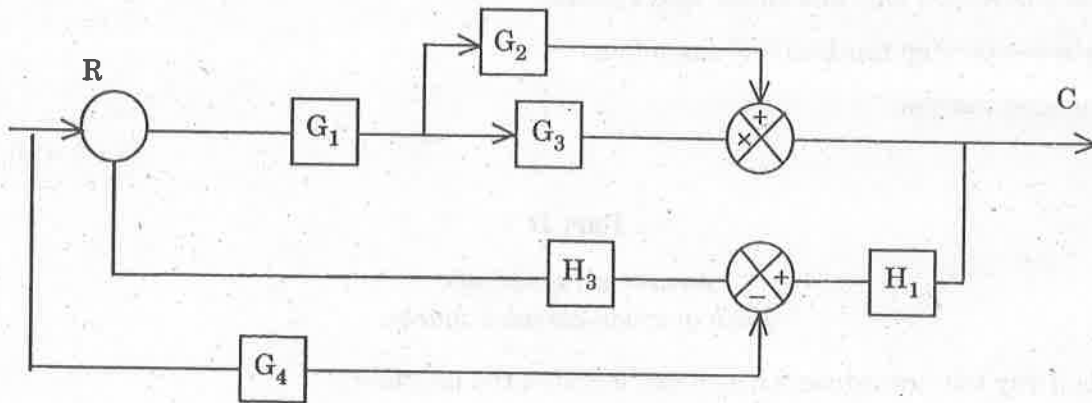
13. Write notes on : Programmable logic controllers with suitable figure.

Or

14. Explain the working of :

    (a) CD.   (b) DVD rom.

    (c) OCR.   (d) Printers.

15. Reduce the block diagram of the figure given below and find out the transfer function.:

Or

16. Write notes on :

    (a) Integrating devices.   (4 marks)

    (b) Comparators.   (4 marks)

    (c) Hydraulic servomotors.   (4 marks)

17. For a unity feed back system having $G(s) = \dfrac{25}{s(s+10)}$ find (a) w_b ; (b) ξ ; (c) w_d ; (d) t_p ; (e) M_p.

Or

18. Using Routh-Hurwitz criteria check whether the system represented by the following characteristics equation is stable or not :

$$s^4 + 2s^3 + 6s^2 + 8s + 8 = 0$$

Comment on the location of roots.

19. Sketch the polar plot of the transfer function $G(s) = \dfrac{20}{s(s+1)}$.

Or

20. Sketch the Blode plot for the system having its open loop transfer function as

$$G(s)\,H(s) = \dfrac{20}{s(s+1)(s+4)}.$$

(5 × 12 = 60 marks)

G 1960

(Pages : 2)

Reg. No..............................

Name..............................

B.TECH. DEGREE EXAMINATION, MAY 2018

Sixth Semester

Branch : Mechanical Engineering

ME 010 606 L03—AUTOMOBILE ENGINEERING (Elective-I) [ME]

(New Scheme—2010 Admission onwards)

[Improvement/Supplementary]

Time : Three Hours

Maximum : 100 Marks

Part A

Answer all questions.
Each question carries 3 marks.

1. Briefly explain inlet and exhaust system in a spark ignition engine.

2. Write notes on "overdrives".

3. Discuss the functions of a suspension system.

4. Classify different types of chassis.

5. Write notes on "dashboard instruments".

(5 × 3 = 15 marks)

Part B

Answer all questions.
Each question carries 5 marks.

6. Explain with neat figure CRDI system.

7. Explain the working of a torque converter with neat figure.

8. Explain rigid axle and independent suspension system.

9. Explain the working of anti-lock braking system. What are its advantages ?

10. Write notes on engine overhauling.

(5 × 5 = 25 marks)

Part C

Answer all questions.
Each full question carries 12 marks.

11. (a) Explain the working of a Jack pump. (5 marks)

(b) Explain with neat figure working of a lubricating system. (7 marks)

Or

Turn over

12. (a) Explain :

    (i)   Air resistance.

    (ii) Rolling resistance.

    (iii) Radiant resistance.

                                                  (6 marks)

 (b) Write notes on "gradeability" of a vehicle. (6 marks)

13. (a) Explain the working of a constant mesh gear box with neat figure. (6 marks)

 (b) Explain single plate clutch working with neat figure. (6 marks)

Or

14. (a) Explain :

    (i)   Front wheel drives. (2 marks)

    (ii) Rear wheel drives. (2 marks)

    (iii) All wheel drives. (2 marks)

 (b) Explain Hotchhiss drives. (6 marks)

15. (a) Explain working of Ackermann steering system. (7 marks)

 (b) Explain different types of springs used in automobiles. (5 marks)

Or

16. (a) Explain working of air suspension system. (4 marks)

 (b) Explain the following :

    (i)   Caster. (2 marks)

    (ii) Camber. (2 marks)

    (iii) King pin inclination. (2 marks)

    (iv) Wheel alignment. (2 marks)

17. (a) Explain the :

    (i)   Crumble zones. (2 marks)

    (ii) Air bags. (2 marks)

    (iii) Side impact beams. (2 marks)

 (b) Explain working of hydraulic brakes with neat figure. (6 marks)

Or

18. (a) Write notes on Tubeless and Radial tyres. (7 marks)

 (b) Discuss the different types of wears on tyres and the reasons behind it. (5 marks)

19. With neat figure, explain working of electronic ignition system.

Or

20. Explain preventive and breakdown maintenance on automobiles.

[5 × 12 = 60 marks]

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

Name..............................

B.TECH. DEGREE EXAMINATION, MAY 2018

Sixth Semester

Branch : Mechanical Engineering

ME 010 606 L06—PROJECT MANAGEMENT (Elective I) (ME)

(New Scheme—2010 Admission onwards)

[Improvement/Supplementary]

Time : Three Hours   Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 marks.

1. Explain briefly about SCBA.

2. Discuss how IRR and ARR are differed.

3. Explain about project risk analysis using simulation.

4. What is time cost trade-off ? Discuss.

5. Explain about PMIS.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 marks.

6. Explain the secondary sources of data for market analysis.

7. Discuss the major project cost elements.

8. Explain how economic risks are estimated.

9. List out and explain project scheduling techniques.

10. Discuss in detail about computer aided project management

(5 × 5 = 25 marks)

Part C

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

11. Explain in detail about project formulation.

Or

12. Explain the procedural steps in technical analysis.

Turn over

13. List out and explain any four financial evaluation techniques.

Or

14. Find the IRR of a project involves current out lay of Rs. 1,20,000 results in annual cash in flows of Rs. 20,000 for first four years and Rs. 25,000 for next four years.

15. Explain the major sources of project risks.

Or

16. Discuss the major project risk analysis techniques.

17. Discuss with examples how CPM and PERT are differed.

Or

18. Crew requirement for each activity in a project is given below.

Activity	duration (days)	No. of crew required
0-1	2	4
1-2	3	3
1-3	4	3
2-4	2	5
3-5	4	3
3-6	3	4
4-7	6	3
5-7	6	6
7-9	4	2

Find out the crew requirement per day systematically and level the resource suitably.

19. Explain the features of any one PM software.

Or

20. Discuss about web enabled project management.

(5 × 12 = 60 marks)