

April 2019 Examinations
DIPLOMA IN MECHANICAL ENGINEERING AND
DIPLOMA IN PRODUCTION ENGINEERING
Electrical Drives and Control

Year/Sem: II / IV (EVEN-II)

Max. Marks : 75

Time : 3 hr.

PART-A

(5 x 2 = 10 Marks)

Note: (i) Answer any FIVE questions out of which question No.8 is compulsory.
(ii) All questions carry equal marks.

- 1 State Faradays Laws.
- 2 Write the applications of DC series motor.
- 3 What are the losses in a transformer?
- 4 Define frequency.
- 5 Give the applications of stepper motor.
- 6 What is energy Conservation?
- 7 What are the advantages of SMPS?
- 8 List the types of switches.

PART-B

(5 x 3 = 15 Marks)

Note: (i) Answer any FIVE questions out of which question No. 16 is compulsory.
(ii) All questions carry equal marks.

- 9 Define i) Magnetic flux ii) Flux density
- 10 A resistance of R ohm is connected in series with a parallel circuit consisting of two resistances of 12Ω and 8Ω respectively. The total power dissipated in the circuit is 70 watts when the applied voltage is 20 V. Find the value of R.
- 11 Briefly explain the principle of operation of Universal motor.
- 12 Write short notes on IC voltage regulators.
- 13 Write the Boolean expression, truth table and symbol of the i) OR ii) AND iii) NOT gates
- 14 What is fixed and Modular PLC?
- 15 Explain in brief about Limit switch.
- 16 What are the causes of Electrical accidents?

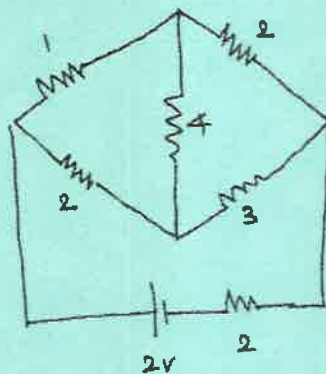
PART-C

(5 x 10 = 50 Marks)

Note: (i) Answer all the questions choosing either sub-division (A) or sub-division (B) of each question.

(ii) All divisions carry equal marks.

- 17 A 10



Determine the current flowing in the 4Ω resistor using Kirchhoff's law.

(OR)

- B With a neat diagram explain the construction and working of DC Generator. 10

- 18 A With a neat diagram explain the construction and working of DOL starter. 10

(OR)

- B Explain the various methods of speed control of three phase induction motor with the relevant diagram. 10

- 19 A i) Explain the construction of PMDC motor. 5
ii) Give the comparison between Individual drives and Group drives. 5
(OR)
B With a neat diagram explain the working of single stepping and half stepping stepper motor drive. 10
- 20 A With a block diagram explain the working of ON-line UPS. 10
(OR)
B Draw the circuit diagram, wave form and explain the working of Half wave rectifier with and with out filter. 10
- 21 A i) With a neat diagram explain the working of float switch. 5
ii) With a neat diagram explain the working of pressure switch. 5
(OR)
B i) Briefly explain the different types of photo electric sensors. 5
ii) With a neat diagram explain the working of ELCB. 5
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PART-A**(5 x 2 = 10 Marks)****Note: (i) Answer any FIVE questions out of which question No.8 is compulsory.****(ii) All questions carry equal marks.**

- 1 What is meant by universal gas constant? Write its value.
- 2 What is free expansion process?
- 3 Define compression ratio and cut off ratio of a diesel cycle.
- 4 What is meant by control volume?
- 5 Define volumetric efficiency of an air compressor.
- 6 Define dryness fraction and wetness fraction.
- 7 Define boiler efficiency.
- 8 Name the impurities present in boiler feed water.

PART-B**(5 x 3 = 15 Marks)****Note: (i) Answer any FIVE questions out of which question No. 16 is compulsory.****(ii) All questions carry equal marks.**

- 9 A cylinder contains 3 kg of Oxygen with molecular weight of 32 has a pressure of 5 bar and a temperature of 27°C. Determine the volume of the cylinder.
- 10 State the assumptions in deriving SFEE.
- 11 State the merits and demerits of multistage air compressor.
- 12 What are the advantages of superheated steam?
- 13 Compare fire tube boiler and water tube boiler.
- 14 State the applications of rockets.
- 15 Compare boiler mountings and boiler accessories.
- 16 An engine working on otto cycle has a cylinder diameter of 150 mm and a stroke of 225 mm. The clearance volume is 1.25 litres. Find the air standard efficiency of the engine.

PART-C**(5 x 10 = 50 Marks)****Note: (i) Answer all the questions choosing either sub-division (A) or sub-division (B) of each question.****(ii) All divisions carry equal marks.**

- 17 A 0.5 kg of air at 180°C expands adiabatically to 3 times its original volume, during the expansion the temperature reduced to 20°C and work done during the expansion is 53 KNm. Find C_p , C_v and R 10
- (OR)**
- B 2 kg of an ideal gas is compressed politropically from a pressure of 1.5 bar and 16°C to a pressure of 7.5 bar according to the law $PV^{1.3} = C$. Determine initial volume , final temperature , change in internal energy and change in entropy. $C_p=1.005$ KJ/kgK, $R = 0.28$ KJ/kgK. 10
- 18 A A Diesel cycle has a compression ratio of 18 and the heat transferred to the working fluid per cycle is 1800 KJ/kg .The pressure and temperature at the beginning of compression stoke are 1 bar and 300K. Calculate the thermal efficiency and temperature at each point of the cycle. $C_p=1.005$ KJ/kgK, $C_v=0.718$ KJ/kgK, $R = 0.287$ KJ/kgK. 10

(OR)

- B In a gas turbine air flows at the rate of 4 kg/s. The velocity and enthalpy of air at entrance are 250 m/s and 6930 KJ/kg respectively. At the exit the velocity is 170 m/s and the enthalpy is 5040 KJ/kg. As the air passes through the turbine, a heat loss of 42 KJ/kg occurs. Find the power developed by the turbine. 10
- 19 A Find the percentage of saving in work by compressing air in two stages from 1 bar to 7 bar instead of in one stage. Assume the compression index is 1.35 in both cases and complete intercooling in two stage compressor. 10
- (OR)
- B Explain with a neat sketch the working of a ramjet. State its applications and advantages 10
- 20 A Determine the internal energy of 1 kg of steam at a pressure of 8 bar when the steam is (i) wet with dryness fraction 0.9 (ii) dry and saturated (iii) superheated with a temperature of 200°C. Assume C_p of superheated steam as 2.25 KJ/kgK 10
- (OR)
- B Steam at a pressure of 4 bar and 0.75 dry is heated at constant volume to a pressure of 5 bar. Find the final condition of steam and heat absorbed by one kg of steam 10
- 21 A Explain the working of Lamont boiler with a neat sketch. 10

(OR)

The following results were obtained in a boiler trial.

Feed water / hr = 750 kg at 25°C

Steam produced = 0.95 dry at 8 bar

Coal used / hr = 100 kg with $C_V=27200$ KJ/kg

Ash and un burnt coal collected = 8 kg / hr. with C_V of 2800 KJ/kg

Mass of flue gas per kg of coal burnt = 17 kg

Flue gas temperature = 325°C

Air temperature = 15°C

Specific heat of flue gas = 1.005 KJ/kgK

Find

- (i) Boiler efficiency
- (ii) Draw up heat balance sheet

THIAGARAJAR POLYTECHNIC COLLEGE, SALEM

(Autonomous)

Reg. No.

April 2019 Examinations

DIPLOMA IN MECHANICAL ENGINEERING

Special Machines

Year/Sem: II / IV (EVEN-II)

Max. Marks : 75

Time : 3 hr.

PART-A**(5 x 2 = 10 Marks)****Note: (i) Answer any FIVE questions out of which question No.8 is compulsory.****(ii) All questions carry equal marks.**

- 1 What is Elastomer?
- 2 What is the function of a clapper box in a shaper?
- 3 What is plasma?
- 4 Why is progressive cut broach is called so?
- 5 Define gear shaving.
- 6 Distinguish between a plain milling machine and universal milling machine.
- 7 Name the types of bonds used for grinding wheel.
- 8 What is CMM?

PART-B**(5 x 3 = 15 Marks)****Note: (i) Answer any FIVE questions out of which question No. 16 is compulsory.****(ii) All questions carry equal marks.**

- 9 Draw a single extruder and mark its parts.
- 10 Differentiate between a draw cut shaper and push cut shaper.
- 11 List out four types of milling cutter.
- 12 What is gear lapping?
- 13 Why soft wheel is used for grinding hard piece and vice versa?
- 14 What is electro chemical machining?
- 15 How back lash is eliminated in Re-circulated ball screw mechanism.
- 16 Compare between shaper and planer with respect to cutting action and types of jobs.

PART-C**(5 x 10 = 50 Marks)****Note: (i) Answer all the questions choosing either sub-division (A) or sub-division (B) of each question.****(ii) All divisions carry equal marks.**

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|----|---|--|----|
| 17 | A | With a neat sketch explain the reciprocating screw injection process. | 10 |
| | | (OR) | |
| | B | Elaborate the various design consideration for plastic components. | 10 |
| 18 | A | i) Sketch double housing planer and label the principle parts. | 5 |
| | | ii) Draw a neat sketch of vertical broaching machine and explain. | 5 |
| | | (OR) | |
| | B | Explain with a neat sketch the crank and slotted link quick return mechanism used in shaper. | 10 |
| 19 | A | Draw a neat sketch of a column and knee type horizontal milling machine and explain its working. | 10 |
| | | (OR) | |
| | B | What are the various materials commonly used for making gears? Describe briefly any three. | 10 |
| 20 | A | With a neat sketch explain laser beam machining and state the advantages. | 10 |
| | | (OR) | |
| | B | Describe briefly the various factors considered in selection of a grinding wheel. | 10 |
| 21 | A | Explain the various types of tool magazine in CNC machining. | 10 |
| | | (OR) | |
| | B | i) Compare NC and CNC (any five) | 5 |
| | | ii) Sketch the schematic diagram of a CNC machine tool. | 5 |

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DIPLOMA IN MECHANICAL ENGINEERING

Theory of Machines

Year/Sem: II / IV (EVEN-II)

Max. Marks : 75

Time : 3 hr.

PART-A**(5 x 2 = 10 Marks)****Note: (i) Answer any FIVE questions out of which question No.8 is compulsory.****(ii) All questions carry equal marks.**

- 1 What is a kinematic link?
- 2 What is a mechanism?
- 3 What is a journal bearing?
- 4 What is the difference between clutch and brake?
- 5 What is the use of crossed belt drive?
- 6 What is a knife edge follower?
- 7 What is static balancing?
- 8 What is coefficient of fluctuation of energy?

PART-B**(5 x 3 = 15 Marks)****Note: (i) Answer any FIVE questions out of which question No. 16 is compulsory.****(ii) All questions carry equal marks.**

- 9 What is successfully constrained motion?
- 10 What are the types of joints in kinematic chains?
- 11 Sketch the construction of a multicollar bearing.
- 12 What is an absorption dynamometer?
- 13 What is prime circle in a cam?
- 14 What is the necessity of balancing rotating masses?
- 15 What is a simple gear train?
- 16 What is initial tension in the belt?

PART-C**(5 x 10 = 50 Marks)****Note: (i) Answer all the questions choosing either sub-division (A) or sub-division (B) of each question.****(ii) All divisions carry equal marks.**

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|----|---|---|--------|
| 17 | A | Explain the classification of kinematic pairs. | 10 |
| | | (OR) | |
| | B | Explain the crank and slotted lever quick return mechanism. | 10 |
| 18 | A | i. What is conical pivot bearing? State its applications.
ii. A single plate clutch, with both sides effective, is required to transmit 25 kW at 3000 rpm. Determine the outer and inner radii of frictional surface if the coefficient of friction is 0.255, the ratio of radii is 1.25 and the maximum pressure is not to exceed 0.1 N/mm ² . | 5
5 |
| | | (OR) | |
| | B | i. Explain with a neat sketch, the working of prony brake dynamometer.
ii. Explain the working of torsion dynamometer. | 5
5 |
| 19 | A | A shaft rotating at 200 rpm drives another shaft at 300 rpm and transmits 6 kW through a open belt drive. The distance between the shafts is 4 m. The smaller pulley is 0.5 m in diameter. If $\mu = 0.3$, find tensions in tight side and slack side. | 10 |
| | | (OR) | |
| | B | i. What are the advantages and disadvantages of gear drives?
ii. Briefly explain the working of reverted gear train. | 5
5 |

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- 20 A i. With neat sketches, explain roller follower and flat faced follower. 5
ii. Draw displacement, velocity and acceleration diagrams when the follower moves with constant velocity. 5

(OR)

- B A cam, with a minimum radius of 25 mm, rotating clockwise at a uniform speed is to be designed to give a roller follower, at the end of valve rod, motion described below. 10
1. To raise the valve through 50 mm during 120 rotation of the cam
 2. To keep the valve fully raised through next 30
 3. To lower the valve during next 60 and
 4. To keep the valve closed during rest of the revolution i.e.150

The diameter of the roller is 20 mm and the diameter of the cam shaft is 25 mm. The camshaft rotates at 100 rpm. The displacement takes place with simple harmonic motion.

Draw the displacement, the velocity and acceleration diagrams.

- 21 A i. Explain the method of balancing a several rotating mass by a single mass rotating in the same plane. 5
ii. Four masses m_1, m_2, m_3 and m_4 are attached to a shaft and revolve in the same plane. The masses are 200 kg, 300 kg, 240 kg and 260 kg respectively and their radii of rotations are 0.2 m, 0.15 m, 0.25 m and 0.3 m respectively. The angles between successive masses are $45^\circ, 75^\circ$ and 135° . Find the magnitude and position of the balancing mass at a radius of 0.2 m. 5

(OR)

- B i. Explain the turning moment diagram of a four stroke cycle internal combustion engine. 5
ii. A horizontal cross compound steam engine develops 300 kW at 90 rpm. The coefficient of fluctuation of energy as found from the turning moment diagram is to be 0.1 and the fluctuation of speed is to be kept within $\pm 0.5\%$ of mean speed. Find the weight of the flywheel required, if the radius of gyration is 2 m. 5
