THIRD SEMESTER B.TECH DEGREE EXAMINATION

(2013 Scheme)

13.301 ENGINEERING MATHEMATICS-II (ABCEFHMNPRSTU)

MODEL QUESTION PAPER

Time: 3 hours Maximum marks: 100

PART-A

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

1. A particle moves so that its position vector is given by

$\vec{r} = coswt\,\hat{\imath} + sinwt\,\hat{\jmath}$, show that the velocity $\overrightarrow{V}$ of the particle is perpendicular to $\vec{r}$.

2. If $f(x) = x\ ,\ o < x < \frac{\pi}{2}$

$= \pi - x\ ,\ \frac{\pi}{2} < x < \pi$. Show that $f(x) = \frac{4}{\pi}\left(sinx - \frac{sin3x}{3^2} + \frac{sin5x}{5^2} - \cdots\right)$

3. Find the cosine transform of $f(x) = sinx$ in $0 < x < \pi$.

4. Solve the partial differential equation if $\frac{\partial z}{\partial x} = 6x + 3y$; $\frac{\partial z}{\partial y} = 3x - 4y$.

5. State the assumptions involved in the derivation of one dimensional Heat equation.

PART-B

*Answer **one full** question from **each** module. **Each** question carries **20** marks.*

MODULE-I

6. a) Find the constants a and b so that the surfaces $5x^2 - 2yz - 9x = 0$ and $ax^2y + bz^3 = 4$, may cut orthogonally at the point $(1,-1,2)$.

b) If φ is a scalar point function, use Stoke's theorem to prove that $Curl(grad\ \varphi) = 0$.

c) Evaluate by Green's theorem in the plane for $\int_C (y - sinx)dx + cosx\ dy$ where C is the boundary of the triangle whose vertices are $(0,0), (\frac{\pi}{2}, 0)\ and\ (\frac{\pi}{2}, 1)$.

7. a) If $\vec{r} = x\,\hat{\imath} + y\,\hat{\jmath} + z\,\hat{k}$ prove that $\nabla r^n = nr^{n-2}\,\vec{r}$ where $r = |\vec{r}|$.

b) Show that $\vec{F} = e^x\left[(2y + 3z)\hat{\imath} + 2\hat{\jmath} + 3\hat{k}\right]$ is irrotational and find its scalar potential.

c) Using divergence theorem, evaluate $\iint_S F.\hat{n}\,ds$ where $\overrightarrow{F} = 4x\hat{\imath} - 2y^2\hat{\jmath} + z^2\hat{k}$ and S is the surface bounding $x^2 + y^2 = 4, z = 0$ and $z = 3$

MODULE-II

8. a) Obtain the Fourier series of the function $f(x) = \left(\frac{\pi - x}{2}\right)^2$ in $(0, 2\pi)$

b) Find the Fourier transform of $f(x) = 1\ , |x| < a$

$= 0\ , |x| \geq a$

Hence evaluate $\int_0^\infty \frac{sinx}{x} dx$

9. a) Find the Fourier series of $f(x) = -x + 1\ , -\pi \leq x \leq 0$

$= x + 1\quad ,\quad 0 \leq x \leq \pi$

b) Find the Fourier cosine transform of $f(x) = e^{-4x}$ and

hence show that $\int_0^\infty \frac{cos2x}{x^2+16} dx = \frac{\pi}{8} e^{-8}$

MODULE-III

10. a) Solve the pde $pxy + pq + qy = yz$.

b) Solve the pde $(D^2 - DD' + 2D'^2)z = e^{3x+4y} + \sin(x - y)$

11. a) Solve the partial differential equation $x(y^2 - z^2)p - y(z^2 + x^2)q = z(x^2 + y^2)$

b) Solve the pde $(D^2 + DD' - 6D'^2)z = ycosx$

MODULE-IV

12. a) Using the method of separation of variables, solve $\frac{\partial u}{\partial x} - 2\frac{\partial u}{\partial t} = u$ given that

$u = 3e^{-5x} + 2e^{-3x}$ when $t = 0$.

b) A string of length l is fixed at both the ends. The midpoint of the string is taken to a height b and then released from rest in that position. Find the displacement of the string.

13. a) Solve $\frac{\partial u}{\partial t} = \alpha^2 \frac{\partial^2 u}{\partial x^2}$ subject to the condition, $u(0, t) = 0 = u(\pi, t)$ and

$u(x, 0) = \pi x - x^2$ in (0,π)

b) A rod of length l has its ends A and B kept at 0^0C and 100^0C respectively until steady conditions prevail. The temperature at A is suddenly raised to 25^0C and at the same time that B is lowered to 75^0C and the end temperatures are thereafter maintained. Find the temperature function $U(x, t)$.

THIRD SEMESTER BTECH DEGREE EXAMINATION 2014

(SCHEME: 2013)

Branch: Mechanical - Stream -Industrial Engineering

13.302 INTRODUCTION TO INDUSTRIAL ENGINEERING (N)

MODEL QUESTION PAPER

Time: 3 hours Maximum marks: 100

Instructions: *1) Any missing data shall be assumed. **All** assumptions must be clearly stated.*
2) Use of standard normal and binomial tables allowed.

PART-A

*Answer **all** questions. **Each** question carries 2 marks*

1. Explain the role of Industrial Engineering in modern world problem solving.

2. Compare Management and Industrial Engineering.

3. What differences exist between a joint stock company and a partnership firm?

4. What is meant by span of control? Give a suitable example.

5. What are covered under intellectual property rights?

6. "The modern industry is looking for creative thinking". Substantiate this argument with a suitable example.

7. A machine can produce good items with probability 0.95 and bad items with probability 0.05. What is the probability that in a lot of 10 items, there will be exactly 9 good items? If one more item is added to the lot, how this probability will change?

8. What is the importance of productivity in an industry?

9. Explain the nature and importance of double entry book keeping.

10. What is the importance of a balance sheet? What are included in it?

(5 x 4 Marks = 20 Marks)

PART-B

*Answer **one full** question from **each** module. **Each** question carries **20** marks.*

MODULE - I

11. Discuss the contributions of F. W. Taylor in scientific management. Explain how Taylor's works contributed to the growth of industrial engineering as a new engineering discipline. (20)

OR

12. (a) Explain the principles of management and discuss in brief the functions of management. (10)

(b) Explain ownership and bring about the differences between a public limited company and a private limited company. What are the procedures to establish a company in India? (10)

MODULE – II

13. Write notes with suitable examples on: (a) functional organization, (b) line and staff organization, (c) committee organization, and (d) matrix organization (20)

OR

14. (a) Explain the principles of a good product design and the benefits of a good design. (10)

(b) With the help of a neat sketch, explain the product life cycle of a consumer durable product. Discuss the importance of each phase in the curve. (10)

MODULE – III

15. (a) Discuss and differentiate decision making under uncertainty and under risk. What tools are available for decision making in these situations? (10)

(b) Explain the properties of normal probability distribution with a sketch. What are the uses of normal distribution in industrial decision making? (10)

OR

16. What is meant by productivity? How do it is defined? Explain and differentiate between: (a) partial productivity, (b) total factor productivity, and (c) total productivity. What are the uses of each of these terms? (20)

MODULE – IV

17. (a) Discuss how the profit and loss accounts are prepared. What are the contents of a profit and loss account? (10)

(b) Explain the concept of depreciation. How depreciation of deteriorating items is accounted in the book of accounts? (10)

OR

18. (a) Explain cost-volume profit analysis. What are its applications in industrial engineering? (10)

(b) The manufacturing of an item requires a fixed investment of Rs. 1,00,000/-. The direct cost of labour and materials required for the manufacturing of a single item amounts to Rs. 450/-. The selling price of an item is Rs. 750/-. What is the break-even point? What should be the production volume to achieve a 20% profit? (10)

THIRD SEMESTER BTECH DEGREE EXAMINATION 2014

(SCHEME: 2013)

Branch: Mechanical - Stream -Industrial Engineering

13.303 FLUID MECHANICS AND MACHINES (N)

MODEL QUESTION PAPER

Time: 3 hours Maximum marks: 100

PART-A

*Answer **all** questions. **Each** question carries 2 marks*

1. What is the significance of the vapor pressure of a fluid?

2. State Pascal's law of fluid statics.

3. What are the stream lines and streak lines in fluid dynamics?

4. What are assumptions made in the derivation of Bernoulli equation?

5. Define Reynold's number for the flow of fluids through a pipe.

6. Write down the Darcy-Weisbach relation, what is its significance?

7. State the Buckingham pi-theorem.

8. What are the effects of cavitation in a hydraulic turbine?

9. What is the purpose of air vessels fitted to a pumping circuit?

10. Explain spiral flow with a neat sketch. (10 x 2 Marks = 20 Marks)

PART-B

*Answer **one full** question from **each** module. **Each** question carries **20** marks.*

MODULE - I

11. A venturimeter of throat 15cmϕ is connected to an inclined pipe line 30cmϕ. An inverted U-tube containing a liquid of sp. gravity 0.6 connected to the venturi gives a reading of 30cm. Head loss between the main and throat is 0.2 times the kinetic head of the pipe. Determine the rate of flow of water through the pipe.

OR

12. A wooden block (width15cm, depth 30cm, length150cm) of sp. gravity 0.7 floats horizontally on sea water (sp. wt. 10kN) Calculate the volume of water displaced, depth of immersion and the position of the centre of buoyancy. Also determine the metacentric height and comment on the stability of the block.

MODULE – II

13. (a) Explain boundary layer thickness, displacement thickness and momentum thickness.

(b) Oil with density 950 kg/m^3 and kinematic viscosity 2 x 10^{-5}, flows through a 30cmϕ pipe 100m long and with a head loss of 8m. The roughness ratio is $\varepsilon/d = 0.0002$. Find the average velocity and flow rate.

OR

14. (a) Explain laminar and turbulent flows. What are the conditions for a pipe flow to be described as laminar or turbulent?

(b) Three pipes are laid in parallel and are having the following details: Pipe 1 (L=1500m, D=1000mm average friction factor=0.020), Pipe 2 (L=1200m, D=800mm average friction factor=0.020), Pipe 3 (L=1600m, D=1200mm average friction factor=0.024). If the total discharge through the system is 4.0m^3/s, determine the discharge distribution in the pipes and the head loss.

MODULE – III

15. (a) Differentiate between impulse and reaction turbines.

(b) A Pelton wheel revolving at 190 rpm and develops 5150.25 kW when working under a head of 220m with an overall efficiency 80%. Determine unit speed, unit power and unit discharge. The speed ratio of turbine is 0.47. Find the speed, discharge and power when this turbine is working under a head of 140m.

OR

16. (a) Derive the expression for specific speed for a turbine.

(b) A Kaplan turbine develops 9kW under a net head of 7.5m. Overall efficiency of the wheel is 0.85, speed ratio based on outer diameter is 2.2 and the flow ratio is 0.66. Diameter of the boss is 0.35 times the external diameter of the wheel. Determine the diameter and the specific speed of the runner.

MODULE – IV

17. (a) With a neat sketch explain the working of a reciprocating pump.

(b) Explain the working of a hydraulic ram.

OR

18. (a) With neat sketches explain the working of a centrifugal pump.

(b) Write notes on (i) jet pump (ii) vane pump.

THIRD SEMESTER BTECH DEGREE EXAMINATION

(SCHEME: 2013)

13.304 MECHANICS OF SOLIDS (MNPSU)

MODEL QUESTION PAPER

Time: 3 hours Maximum marks: 100

PART-A

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

1. Define elastic constants.

2. Define thermal stress and derive an expression for the stress developed in a bar restrained at both ends subjected to an increase in temperature.

3. Define Principal stress and principal planes.

4. What is meant by pure torsion. Write down torsion equation and explain the terms.

5. Differentiate between short and long column. (5 x 4 Marks = 20 Marks)

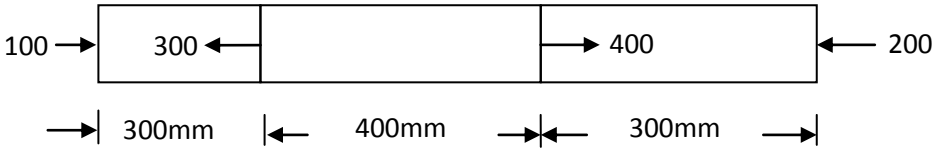
PART-B

*Answer **one full** question from **each** module. **Each** question carries **20** marks.*

MODULE-I

6. (a) Explain the principle of superposition to evaluate total strain of axially loaded bars. (**5**)

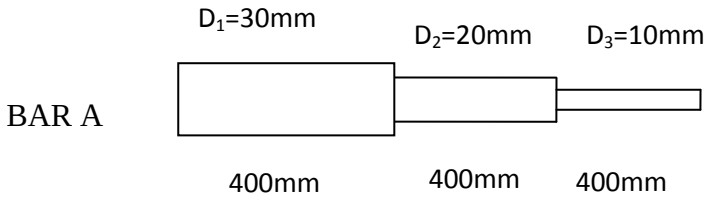
(b) A bar of uniform cross sectional area 100mm^2 carries forces in Newton as shown in fig. Calculate the relative movement of end A with respect to D. Take E=200GPa. (1**5**)

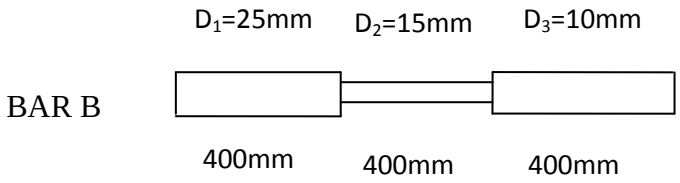


7. A rigid cross bar is supported horizontally by two vertical bars, A and B of equal lengths and hanging from their tops. The bars A and B are 0.6m apart. The cross bars stays horizontal even after a vertical force of 6kN is applied to it at a point 0.4m from B. If the stress in A is 200 MPa, find the stress in B and the area of cross section of the two rods. E_A=200 GPa, E_B=130 GPa. (20)

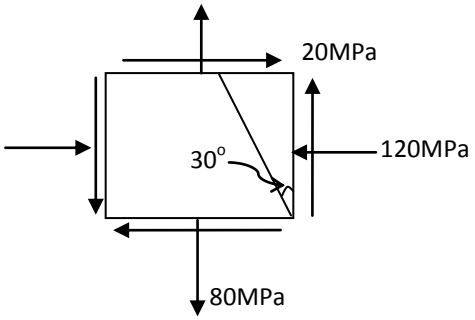
MODULE II

8. Compare the strain energy stored in the bar A with that of bar B ,when the maximum stress produced in both bars is the same. (20)





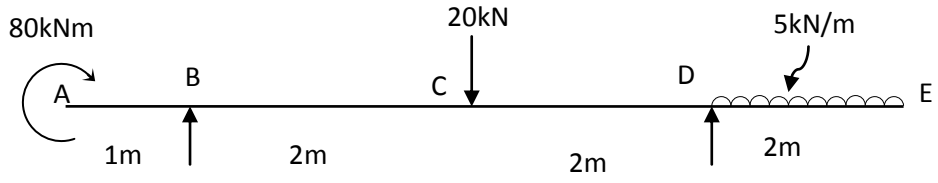
9. Determine the principal stresses and principal planes in an element subjected to stresses as shown in figure below. Also calculate i) Maximum shear stress and its plane ii) Stress conditions in the plane shown. (20)



MODULE III

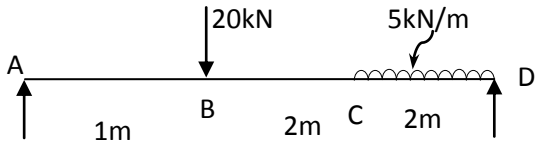
10. Draw shear force and bending moment diagram for the beam shown in figure and mark the salient points. What is the maximum bending stress produced in the beam? The cross section of the beam is hollow rectangular with 150x300mm external and thickness 25mm.

(20)



11. Calculate the maximum deflection and maximum slope for the beam shown in fig. below.

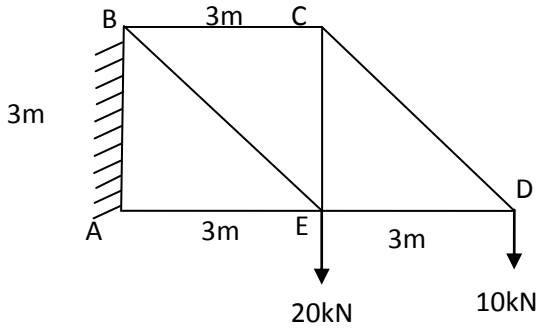
(20)



MODULE IV

12. a) Determine the diameter of the hollow shaft which will transmit 100 kW at 200 rpm if the shear stress is limited to 60 MPa. Take diameter ratio 0.6. (10)

b) Analyse the truss given below by method of joints. (10)



13. a) A hollow rectangular column of external depth 1000mm and external width 800mm is 100mm thick. Calculate the maximum and minimum stresses in the section if load of 200kN is acting with an eccentricity of 150mm wrt YY axis. (10)

b) Determine the buckling load for a strut of T-section, the flange width being 150mm, overall depth 100mm and both flange and web 13mm thick. The strut is 3m long and is hinged at both ends. Take E = 200 GPa. (10)

THIRD SEMESTER B TECH DEGREE EXAMINATION

(SCHEME: 2013)

Branch: Mechanical – Stream - Industrial Engineering

13.305 THEORY OF MACHINES (N)

MODEL QUESTION PAPER

Time: 3 Hours Max Mark: 100

Part A

(Answer all questions. Each question carries 2 Marks.)

1. Define mobility of a mechanism.

2. What is Corioli's acceleration?

3. What is slip and creep in a belt drive?

4. State the law of gearing.

5. What are the two advantages of planetary gear train?

6. What is the difference between a fly wheel and governor?

7. What is gyroscopic effect?

8. Define inertia force and inertia torque.

9. Explain the term static balancing and dynamic balancing.

10. Define in short free vibrations, forced vibrations. (10 X 2 Marks= 20 Marks)

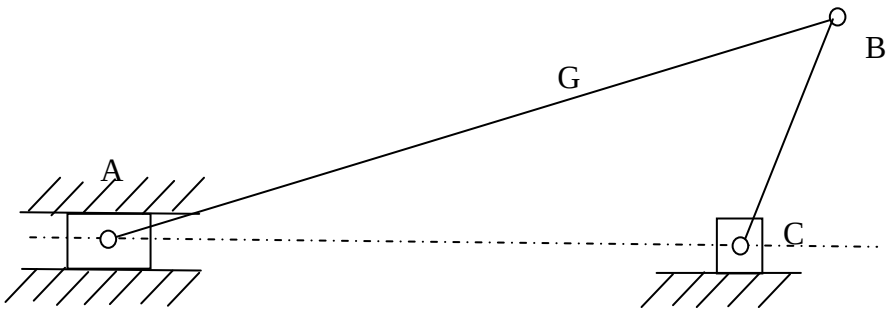
PART-B

*Answer **one full** question from **each** module. **Each** question carries **20** marks.*

MODULE - I

11. a) Explain an inversion of slider crank mechanism.

b) An engine mechanism is shown in figure given below. The crank CB = 100mm and the connecting rod BA = 300mm with centre of gravity G, 100mm from B. In the position shown, the crank shaft has a speed of 75 rad/sec. and an angular acceleration of 1200 rad/sec^2. Find i) velocity of G and angular velocity of AB ii) acceleration of G and angular acceleration of AB.



OR

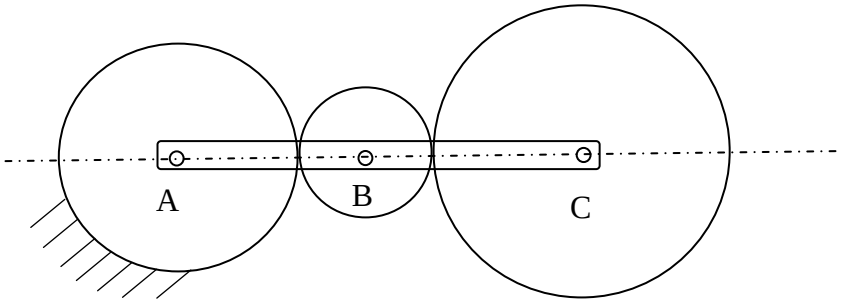
12. a) Derive the relation for the ratio of tension in V belt.

b) In a flat belt drive the initial tension is 2000 N. The coefficient of friction between the belt and pulley is 0.3 and the angle of lap on the smaller pulley is 150^o. The smaller pulley has a radius of 200mm and rotates 500rpm. Find the power transmitted by the belt.

MODULE - II

13. a) State and prove the law of gearing.

b) In an epicyclical gear train as shown in fig 2. The number of teeth on wheel A, B and C are 48, 24 and 50 respectively. If the arm rotates at 400 rpm, find the speed of wheel C when A is fixed.



OR

14. a) Explain with sketches the different types of cams and followers.

b) Draw the profile of a cam when the follower has the following motions i) Rise- 120^o ii) Dwell- 30^o iii) Return- 60^o iv) Dwell- 150^o. Cam radius is 25mm. Follower diameter is 20mm. Motion of the follower is SHM.

MODULE - III

15. a) Explain the following terms relating to governor. I) Stability ii) Sensitiveness iii) Isochronisms iv) Hunting.

b) A porter governor has two balls each of mass 3kg and a central load of mass 50kg. The arms are all 200mm long pivoted on the axis. If the maximum and minimum radii of rotation of the balls are 160mm and 120mm respectively, find the range of speed.

OR

16. a) Derive a relation for gyroscopic couple.

b) A ship travels at a speed of 125km/hr. The mass of turbine rotor is 9 tons and the radius of gyration is 0.6m. It rotates at 1700rpm CW when looking from the bow. Determine the gyroscopic couple if the ship turns to the left in a curve of 90m radius.

MODULE - IV

17. A shaft carries 5masses m_1, m_2, m_3, m_4 and m_5 which revolve at same radius in planes which are at equal distance from one another. The magnitude of masses in planes 1, 3 and 4 are 50kg, 40kg and 30kg respectively .The position of masses 3 and 4 with respect to m_1 are 60^o and 120^o respectively. Determine the weights 2 and 5 and the position with respect to plane in order to put the shaft in complete rotary balance.

OR

18. a) Determine the natural frequency of vibration by equilibrium method.

b) A Lorry of mass 3.64 tons when empty is observed to settle 46 mm during the loading of 3.0 tons of cargo. What periods of vertical vibration will the lorry have on its spring a) when loaded and b) when empty?

THIRD SEMESTER B TECH DEGREE EXAMINATION

(SCHEME: 2013)

Branch: Mechanical – Stream - Industrial Engineering

13.306 ELECTRICAL MACHINES (N)

MODEL QUESTION PAPER

Time: 3 hours Max Marks: 100

Part A

(Answer all questions. Each question carries 2 Marks.)

1. Distinguish between Separately excited and self excited DC generators.

2. Give the principle of operation of a DC motor and explain the significance of back emf.

3. Explain the electrical characteristics of a DC series motor.

4. Draw the phasor diagram of a transformer under no load conditions. Neglect winding resistance and magnetic leakage.

5. Write short note on autotransformer.

6. Derive the emf equation of a synchronous generator.

7. Explain the different types of three phase of induction motors.

8. Give the principles of operation of universal motor.

9. Explain the working of a resistance furnace.

10. Give the advantages of dielectric heating.

(10 x 2 Marks = 20 Marks)

PART-B

*Answer **one full** question from **each** module. **Each** question carries **20** marks.*

MODULE - I

11. a) Explain the open circuit characteristics of a DC generator and also discuss its critical resistances and critical speed. (10)

b) A 20KW compound generator works on full load with a terminal voltage of 230v. The armature, series and shunt field resistance are 0.1ohm, 0.05ohm and 115ohm respectively. Calculate the generator emf when the generator is connected as short shunt. (10)

OR

12. a) What are the different losses in a DC motor? (8)

b) With a neat figure explain a 3 points starter used in a DC motor. (12)

MODULE - II

13. a) Derive the condition for maximum efficiency of a transformer. (8)

b) The iron loos and full load copper loos of a 40kVA 1ϕ tfr are 250w and 750w respectively. Calculate the efficiency at

1) Full load, 0.8 pf lagging.

2) Half load, 0.8 pf lagging.

Also find the load at which efficiency is maximum. (12)

OR

14. a) Explain the principle of operation of a synchronous motor. (10)

b) Explain the different types of instrument used transformers. (10)

MODULE - III

15. a) Explain the different types of motors used in traction system. (10)

b) Discuss the different methods of braking used in traction. (10)

OR

16. a) Explain the production of rotating magnetic field in an induction motor. (10)

b) Discuss the different starting methods used in induction motors. (10)

MODULE - IV

17. a) Write short notes on electric arc furnace. (10)

b) Explain the process of high frequency heating. (10)

OR

18. a) Discuss the different methods of temperature control used in electric heating. (10)

b) Explain the process of induction heating and give any one application. (10)
